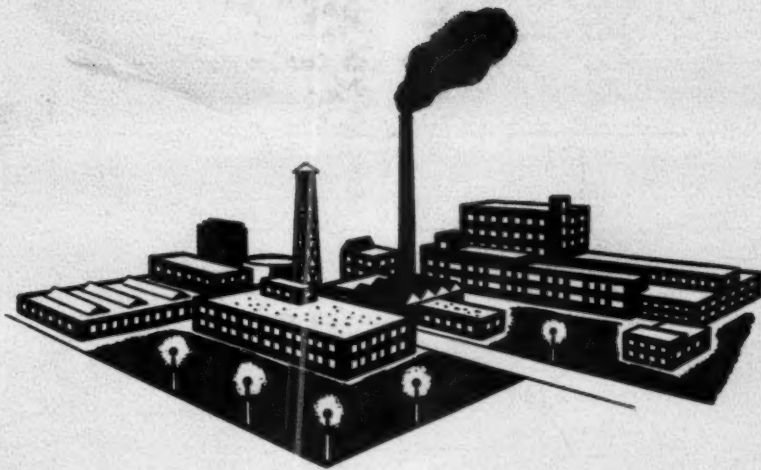


# electrical contracting

*Industrial  
Electrification*  
SECTION

PAGES 47-62



JULY • 1941



## BETTER PROTECTION... FASTER PRODUCTION... USE PLANNED G-E FLOODLIGHTING

Even though emergency production calls for more industrial floodlighting quickly . . . whether complete new installations or additions—there is no need to resort to makeshift protection. Haphazard installation of lights around a plant will not economically illuminate buildings and industrial yards for nighttime protection. Instead, efficient, lowest-cost floodlighting calls for the planned utilization of each unit to provide light where it is needed to prevent trespassing and malicious destruction. G-E lighting engineers have acquired a specialized experience in designing and recommending the right floodlighting facilities to safeguard production, personnel, and property.

### NEW LOW-COST SEARCHLIGHT

General Electric equipment—a complete line of spun- and cast-aluminum, copper-bronze, and porcelain-enamel units for every floodlighting need—now includes a low-cost 18-inch incandescent searchlight. The concentrated beam can be projected in any direction and used to supplement the yard or fence lighting where there is the slightest suspicion of trouble.

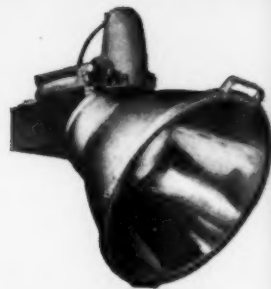
To the contractor who wants his customer to have maximum protection and effectiveness from his next installation: Let your nearest G-E distributor or G-E office supply all the equipment you need—floodlights, cable, time switches, transformers—our extensive distribution service assures prompt delivery. General Electric, Schenectady, N. Y.



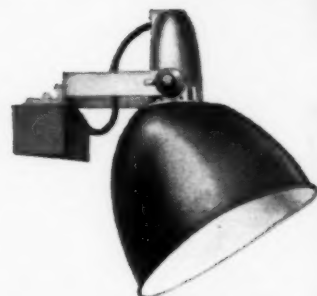
### WE OFFER YOU COMPLETE LIGHTING RECOMMENDATIONS

Your inquiry for suggestions or a complete lighting recommendation will be given immediate attention by a trained lighting specialist in our nearest office. If necessary it will be sent to our Illuminating Engineering Laboratory in Schenectady. This will save you time and money and assure a successful floodlighting job. Write today; there is no cost or obligation.

**GENERAL  ELECTRIC**



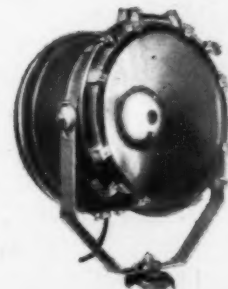
G-E low-priced, spun-aluminum floodlights have a high efficiency that compares favorably with the most expensive copper-bronze or cast-aluminum floodlights. Several beam angles from 28 to 100 degrees and a variety of mounting attachments make these floodlights suitable for almost all applications.



Inexpensive porcelain-enamel, 300- to 1500-watt floodlights produce a wide-angle flood of light used principally for lighting medium- and large-sized ground areas. Auxiliary inside reflectors are used for greater range. One-piece, die-cast aluminum socket housing with rubber cable-in bushing.



The Form 79 luminaire is admirably suited for lighting fence or property lines because of its light-distribution pattern. Deflectors within the globe, or glass refractors, redirect a large portion of the light along and within the fence line. The stepped reflector makes possible the use of 500-watt multiple lamps.



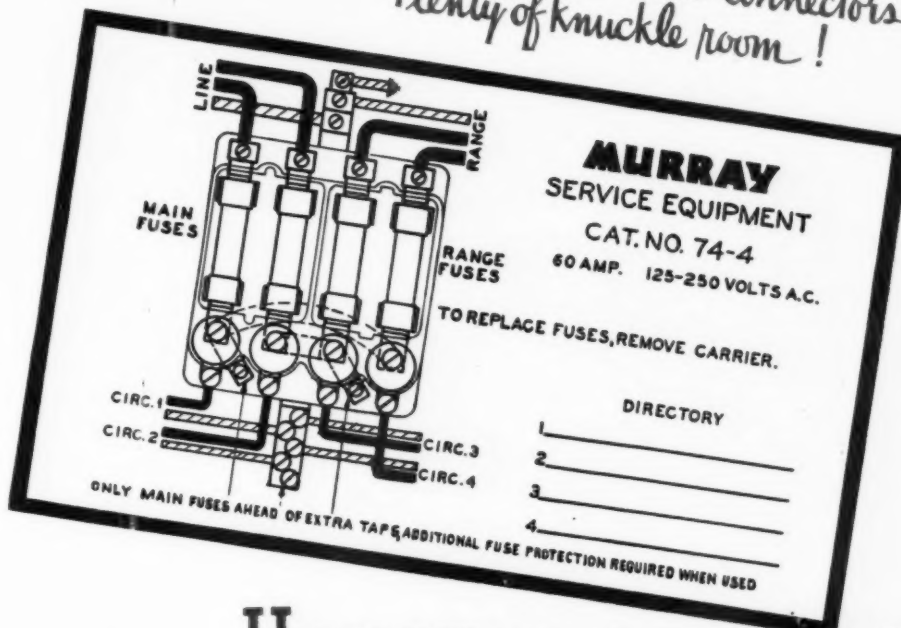
The Type S-5, 1000/1500-watt, 18-inch incandescent searchlight has a parabolic reflector of polished Alzak-finished aluminum or silver glass. A spherical auxiliary reflector in front of the lamp eliminates stray light and builds up the beam intensity. Simplified construction makes the price low—less than half that of earlier searchlights.

# -the "Works"!

## COULD ANYTHING BE SIMPLER?

This is an actual wiring diagram as you find it in the cabinet door of a Murray Cat. No. 74-4.

*Welded, aluminized cabinets!  
Bakelite "pull-outs"!  
Murray Solderless Connectors!  
Plenty of knuckle room!*



**U**SE 'EM ONCE—and you're married to 'em! That's what contractors say who know the downright simplicity of wiring Murray Cat. No. 74-4 (Indoor Type), or Cat. No. 52-4 (Outdoor Type) Switches. Besides wiring simplicity—solderless connectors throughout—plenty of knuckle room and the compactness and good looks are appealing. These are the most popular of the pull-out type combination switches—those with more or less branches are available. Use the coupon. Our territorial representative will put you in touch with nearby dealers. Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, N. Y.

# Murray

## SWITCHES

*Get all  
the facts  
NOW*

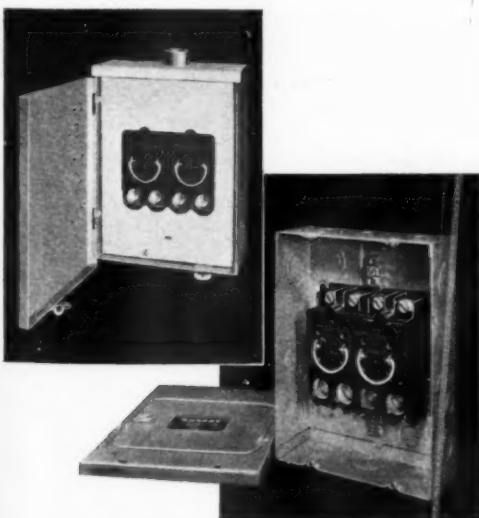
Metropolitan  
Device Corporation  
1250 Atlantic Avenue  
Brooklyn, N. Y.

Please have your representative call and supply full data on Murray Switches.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



ELECTRICAL CONTRACTING, Published monthly, price 25 cents a copy. Vol. 40, No. 7. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription Rates—U. S. A., and Latin-American republics, \$2.00 a year, \$3.00 for two years, \$4.00 for three years. Canada \$2.50 a year, \$4.00 for two years, \$5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries \$3.00 a year, \$6.00 for three years. Entered as second-class matter August 29, 1938, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1941, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

# WESTINGHOUSE "De-ion"

## LINESTARTER

DESIGNED  
FOR EASY INSTALLATION  
BUILT FOR TOUGH SERVICE



Push-button Operated  
—Built-in or mounted  
separately.

### MAGNETIC MOTOR STARTER

CLASS 11-200

#### Features That Make Installation Quick and Easy

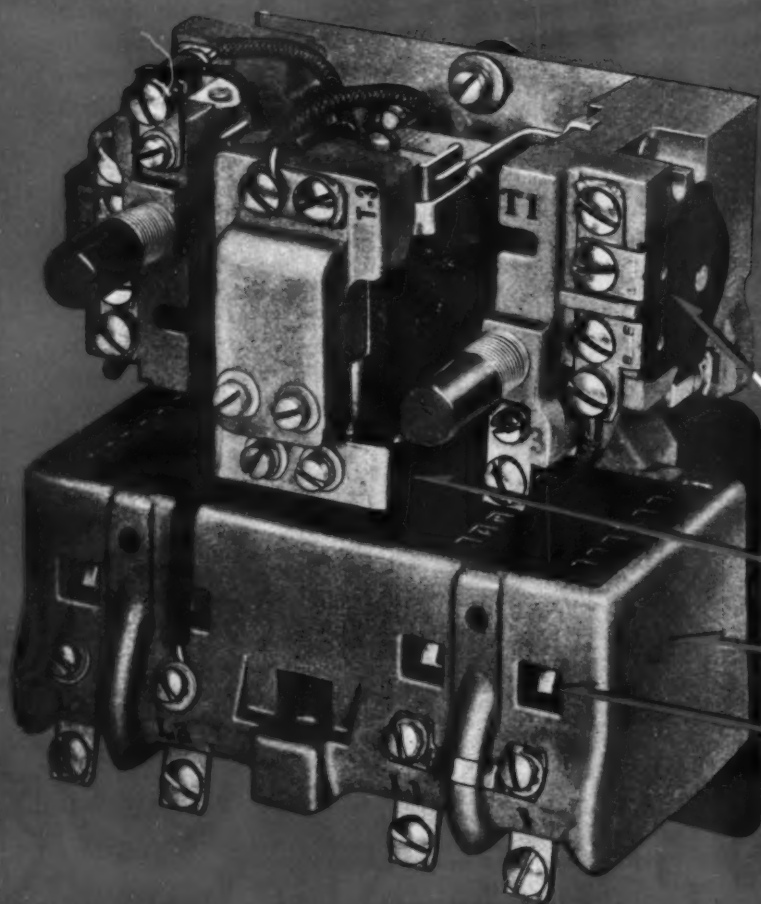
Compact cabinet fits limited space, on machine or separately. Deep-drawn hinged door offers easy access to parts. Ample wiring space. Wiring terminals at front of unit. Concentric knock-outs on top, bottom, both sides. Single screw locks starter in place.

#### Features That Reduce Maintenance Costs

"De-ion" quenchers prolong contact life by rapid arc extinction— $\frac{1}{2}$  cycle. Bi-metal provides accurate, unvarying overload protection. Direct-acting vertical operation—no bearings. Contacts can be inspected without dismantling. Front and back stationary contacts interchangeable. All parts removable from front with screw driver. Non-carbonizing, moisture-resisting arc box.

WESTINGHOUSE ELECTRIC & MFG. COMPANY  
EAST PITTSBURGH, PA.

J-21138



Bi-Metal Overload Protection  
hand or automatic reset.

Vertical Operation  
prevents accidental closing.

"De-ion" Arc Quencher  
prolongs contact life.

Double-break Silver Contacts.

# Westinghouse



**FOR PRODUCTION INSURANCE**

**buy Westinghouse**

**TIME SAVERS  
FOR INDUSTRY**



**WESTINGHOUSE  
COMBINATION LINESTARTER**

**For Motor Control and Circuit  
Protection  
CLASS 11-206**

Magnetic motor starter—motor-circuit switch—motor overload protection—nofuze circuit protection—all in one unit. Bi-metal gives permanently accurate overload protection. "De-ion" quenchers protect contacts—save maintenance. Four-in-one Unit saves installation time—saves space—saves wiring—provides greater protection for operators.



**WESTINGHOUSE "DE-ION"  
MOTOR WATCHMAN**

**Manual Across-the-line Starter  
for Motors up to 7½ hp.  
CLASS 10-100**

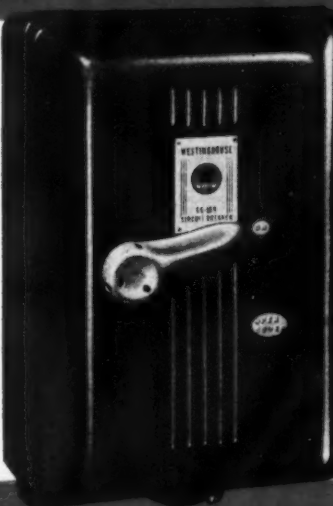
Quick - make, quick - break toggle action prevents "teasing" contacts. "On," "Off," "Tripped" positions self-indicating. Bi-metal disc overload protection. "De-ion" protection for contacts. Ample wiring space. Rust-resisting parts. Silver contacts. Key-hole mounting for quick, easy installation.



**WESTINGHOUSE  
SAFETY SWITCH**

**For Circuit Protection**

Diamond-pointed break jaw and extended-blade construction prevent burning and beading of contacts. One-piece copper construction saves money by preventing power loss. Quick - make, quick-break on Types A and C. Ample space for wiring. Solderless lugs. "De-ion" arc quenchers on 575-V switches.



**WESTINGHOUSE  
AB-1 BREAKER**

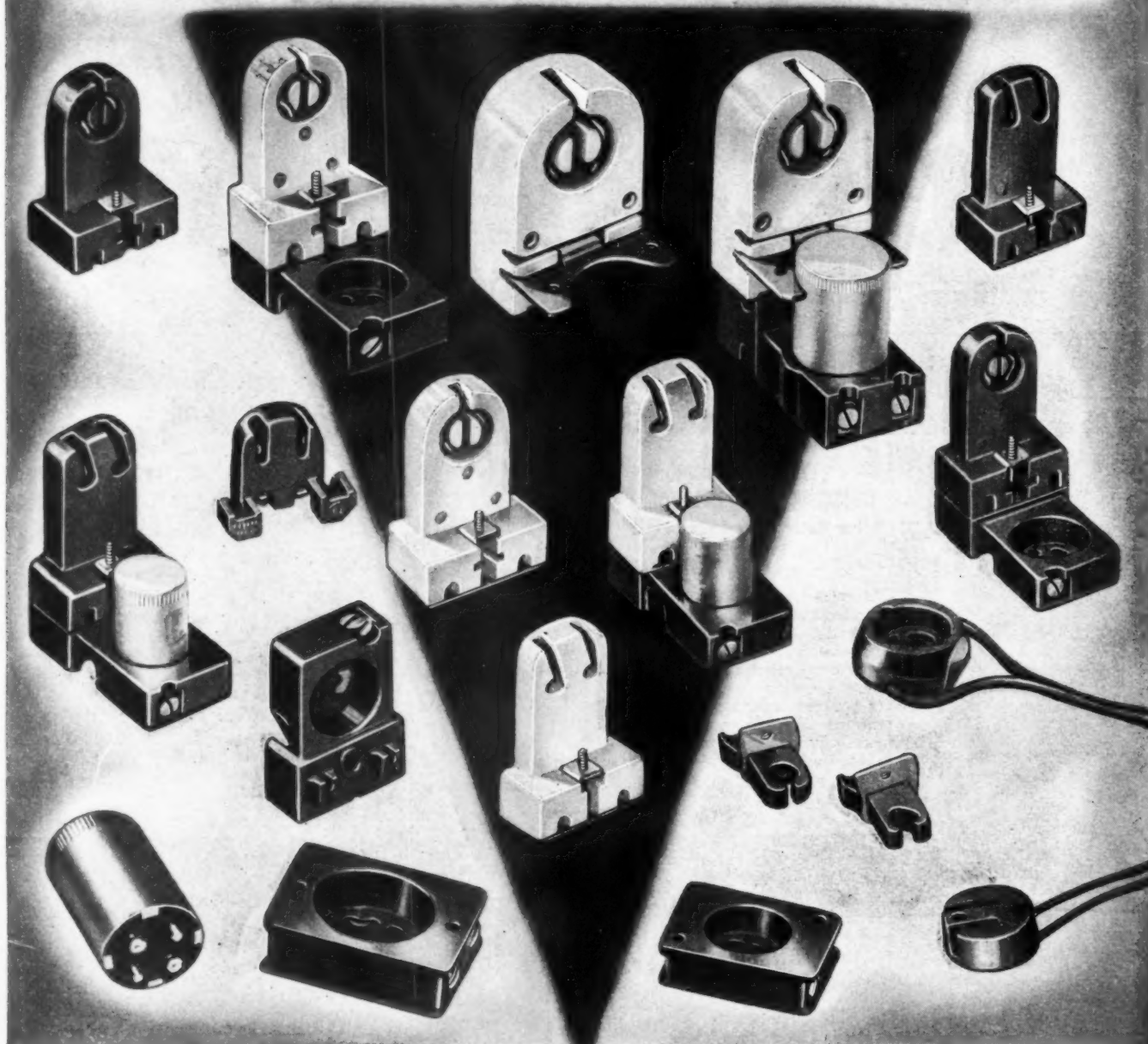
**For Circuit Protection**

Eliminates switch and fuses. Bi-metal overload protection. "De-ion" protection for contacts. Saves maintenance time and production time—circuit outages can be restored by operator. No live parts exposed. Door opens only when switch is in "Off" position. Occupies approximately 40% less space than switch and fuses.

Call your nearest Westinghouse Office or Electrical Wholesaler

**Motors and Control**

# ARROW FLUORESCENT LINE



*newly enlarged:*

LAMPHOLDERS • STARTERS • STARTER SOCKETS • COMBINATIONS

— essential accessories to the better *lighting* that's making *lighter* work of the "all-out" national effort. The complete assortment pictured above includes black and white Bakelite devices of the handiest types. . . Starter sockets and lampholders as separate devices or in combination socket-and-lampholder, as illustrated. This enlarged line of fluorescent units — in the mogul, standard and midget sizes — completely fulfills your industrial-commercial needs.

SOLD THROUGH YOUR

**ARROW ELECTRIC DIVISION**

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

ELECTRICAL WHOLESALER

# DON'T PAY

## FOR CURRENT LOST IN TRANSIT!

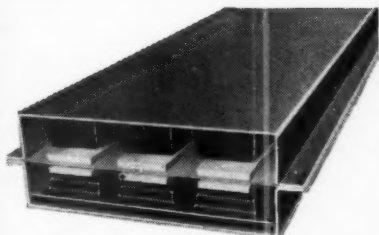
**"LO-X" BUStrIbution DUCT** increases current carrying ability — minimizes losses from heating and voltage drop.

"LO-X," the latest addition to Bull Dog's Flexible Electrical Distribution Systems, assures industrial users of electrical power of ample voltage at the point of application—motor, welder, inductive load—*wherever and whenever needed.*

"LO-X" is designed especially for the most efficient distribution of current in the conductors, and for the most effective heat dissipation characteristics. The result is greater current carrying ability, lower temperature rise and less voltage drop due to reactance.

"LO-X" may be used alone, or it may be used as a Feeder with Bull Dog's "Plug-in" type BUStrIbution DUCT and associated fittings. Whatever the installation, "LO-X" affords a high load capacity, better voltage regulation, greatly reduced line drop—and consequently more efficient and uniform operation.

"LO-X" BUStrIbution DUCT is available in from 500 amp. to 4,000 amp. capacity, 600 volts or less, single phase, three phase, and three phase 4 wire. Write for complete information, or ask to have a Bull Dog sales engineer call on you.



This is an end view of a standard section, three phase "LO-X" BUS DUCT. Reactance drop is kept to a minimum through extremely close spacing of bus bars in a specially designed assembly. This design with its minimized magnetic field permits the use of a rugged steel duct casing with no sacrifice of efficiency.

### BULL DOG

ELECTRIC PRODUCTS CO.

DETROIT, MICHIGAN  
Bull Dog Electric Products of  
Canada, Ltd., Toronto, Ontario



For welder installations such as the one shown here, and for similar inductive loads, especially at low power factors, "LO-X" BUStrIbution DUCT affords a high load capacity, better voltage regulation, and consequently more efficient and uniform operation.

MANUFACTURERS OF Vacu-Break Safety Switches, Circuit Master and SafeToFuse Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

Electrical Contracting, July 1941

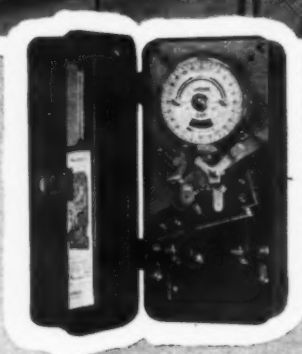


# PLAY SAFE!

ADD THE RELIABILITY OF  
AUTOMATIC CONTROL  
TO INDUSTRIAL FLOODLIGHTING



BENJAMIN ELECTRIC MFG. CO. PHOTO



Form KAZ Astronomic Dial Time-Switch eliminates all manual operation. It can be set to go "on" at dusk, "off" at dawn, automatically changing daily, in accordance with sunset and sunrise.

## WITH SANGAMO TIME-SWITCHES

With industrial plants going full blast on defense orders, considerable business is to be had by the installation of floodlighting systems for the protection of factory yards, substations, transformer banks, and other vital points. Sangamo Time-Switches make such floodlighting installations more reliable by providing accurate, and completely automatic, control. A complete line, including astronomic dial, automatic carry-over, and outdoor time-switches, permits the selection of the exact form for any specific requirement.

**SANGAMO ELECTRIC COMPANY** **SPRINGFIELD ILLINOIS**

## AS DIELECTRIC DICK SEZ:

YOU CAN'T FOOL AROUND WITH  
TAPES. I PLAY 'EM SAFE AND  
STICK WITH TWINSULATION.  
GIVES YOU TWICE THE PROTEC-  
TION... COMBINES FRICTION  
AND RUBBER TAPE IN ONE!  
BUY IT AT YOUR WHOLESALER'S!

★ SAFETY FACTOR! A single ply  
will withstand from 7,500 to  
10,000 volts. Approved by  
the Underwriters' Laboratories.

Order from Your Wholesaler



UNITED STATES

ROCKEFELLER CENTER

RUBBER COMPANY

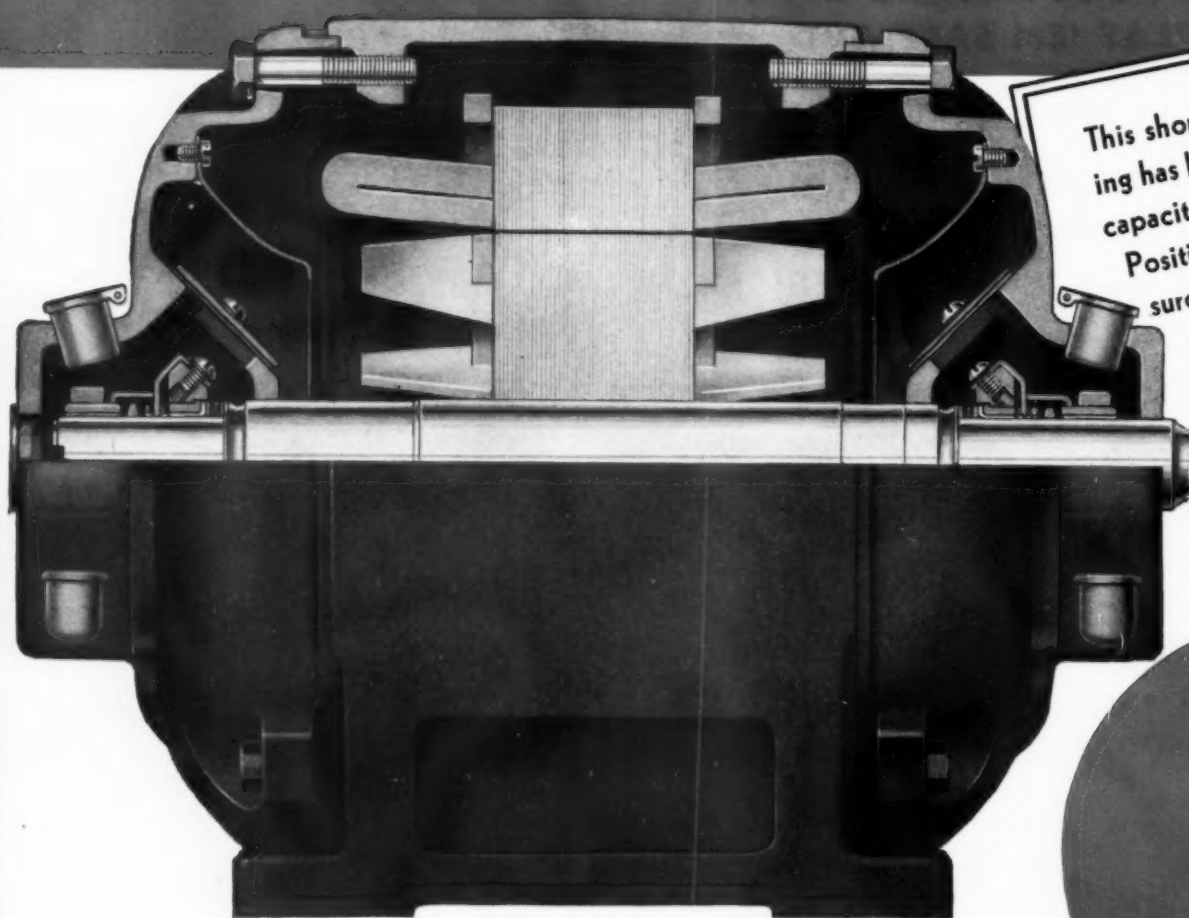
NEW YORK

ALSO MANUFACTURERS OF U. S. ELECTRICAL WIRES AND CABLES

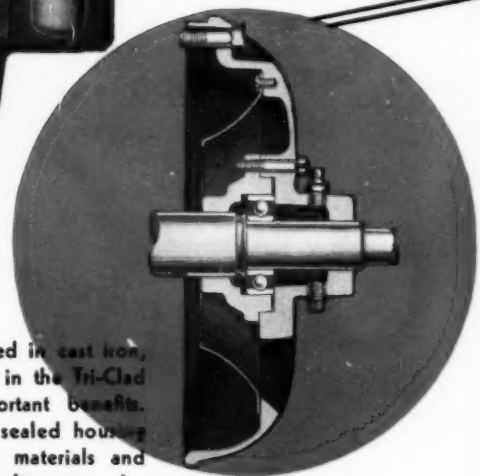
Electrical Contracting, July 1941

# *We Cut*

## YOUR MAINTENANCE WORRIES



This shortened sleeve bearing has higher load-carrying capacity and longer life. Positive lubrication is assured by its corrosion-resisting oil ring and improved spiral grooving—the bearing runs full of oil regardless of the direction from which the load is imposed.



*Built for protection first...  
...to last!*

Completely housed in cast iron, the ball bearings in the Tri-Clad motor offer important benefits. The single-joint, sealed housing excludes foreign materials and maintains proper alignment. An improved pressure-relief lubrication system facilitates getting fresh grease where it is needed and helps to expel worn-out grease.

**TRI CLAD**  
**INDUCTION MOTOR**  
**GIVES EXTRA PROTECTION 3 WAYS**

**Extra  
Protection**

against physical damage  
The strong, one-piece cast-iron frame and end shields, with upper portion completely enclosed, protect vital motor parts from external blows, flying chips, settling dust, and dripping liquids.

# When We Cut

## THE ENDS OFF THE BEARINGS

In the Tri-Clad motor, G.E. uses  
a **SHORTER** sleeve bearing  
for **LONGER** life



### *Extra Protection* against operating wear and tear

For years, G-E motor designers have been experimenting with sleeve bearings of all kinds. They have found that a shorter sleeve bearing—one with new diameter-to-length proportions and a more effective type spiral grooving—is a fundamentally better bearing; that such a bearing can successfully withstand the stress imposed by short-center, hinged-base drives and similar applications.

In addition, the new sleeve-bearing housings on Tri-Clad motors are dust- and oil-tight. These and many other features are your assurance of a dependable, free-running motor.

In Tri-Clad ball-bearing motors, the bearing is completely enclosed in cast iron. There are only three major parts in the bearing assembly—the end shield, the inner cap, and the bearing itself. Close-fitting running seals keep out ball bearings' worst enemies—dust, dirt, and water.

You'll find that Tri-Clad motors are unusually quiet and smooth-running; you'll find that they stay on the line when the going is tough. They'll give your production *extra protection* during *extra* years of service. Specify them on your next motor order. General Electric, Schenectady, N. Y.

### *Extra Protection*

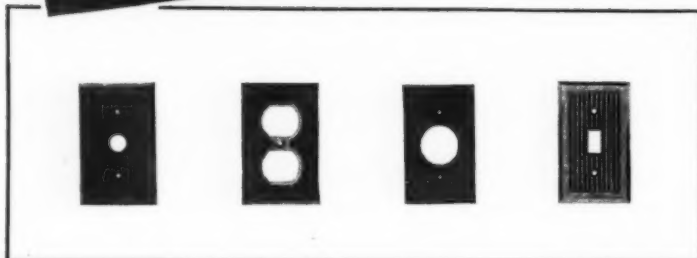
against electrical breakdown

Stator windings of Formex wire give extra protection against moisture, oil, abrasion, and heat shock. A tough, synthetic resin bonds the coils, and a coat of Glyptal 1201 Red on the end windings completes an insulation which maintains its strength during years of strenuous service.

**GENERAL**  **ELECTRIC**

750-28-8058

# BRYANT UNILINE WALL PLATES



## Cooperation of manufacturers gives you standard design and colors in a Uniline series of plates

For your greater convenience in ordering and installing modern wall plates, Bryant and five other leading manufacturers have standardized their designs, colors and catalog numbers of a *Uniline* series. Your old problems of matching different brands and designs are entirely eliminated by this co-operative effort on behalf of architects, contractors, suppliers and wiring men.

Brown or ivory color shades used by the six manufacturers of *Uniline* Plates are always the same. The patented design is identical for all makes. Catalog numbers are standard on

each plate with *Uniline* manufacturers.

With *Uniline* plates you can be easily assured of getting uniform appearance and serviceability on all jobs. The *Uniline* series includes bakelite plates for tumbler switches, duplex and single convenience outlets, combinations, push switches, blank and telephone plugs.

You will find the *Uniline* series of plates on page 63 of the Bryant Catalog No. 40. Be sure you have a helpful copy handy—why not write for latest pages and prices today? The Bryant Electric Company, Bridgeport, Connecticut.



*Sold Through Electrical Wholesalers Nationally*



## Every outlet deserves a Bryant device

You Can Meet Every  
Portable Cord  
and Cable Need  
With HAZACORD...  
Here Are a Few—

# HAZACORD Gives You These Extras

## HAZACORD WELDING CABLE

FOR Welding Equip-  
ment —

## HAZACORD TYPE S and TYPE SJ CORDS

FOR Electrical Tools and  
Appliances . . . Drop  
Lights and Lamps —

## HAZACORD POWER CABLES

FOR Electric —  
Dredges . . . Shovels  
Power Drills...Loaders  
Conveyors . . . Scrapers  
Any Movable Machinery

### EXTRA FLEXIBILITY

Conductors are of fine, soft, tinned copper wires, rope stranded for flexibility. Won't kink.

### EXTRA INSULATION

The rubber on each conductor is a 40% compound, resilient, strong and moisture resistant.

### EXTRA LIFE

The protective jacket really protects. It is reinforced with strong seine twine cords. With a smooth armor of tough, 60% rubber, vulcanized under heavy pressure in a thick lead mold, Hazacord is built to withstand all kinds of severe punishment.

FOR COMPLETE FACTS  
on any or all Hazacord Portable Cables  
and Cords, just write:

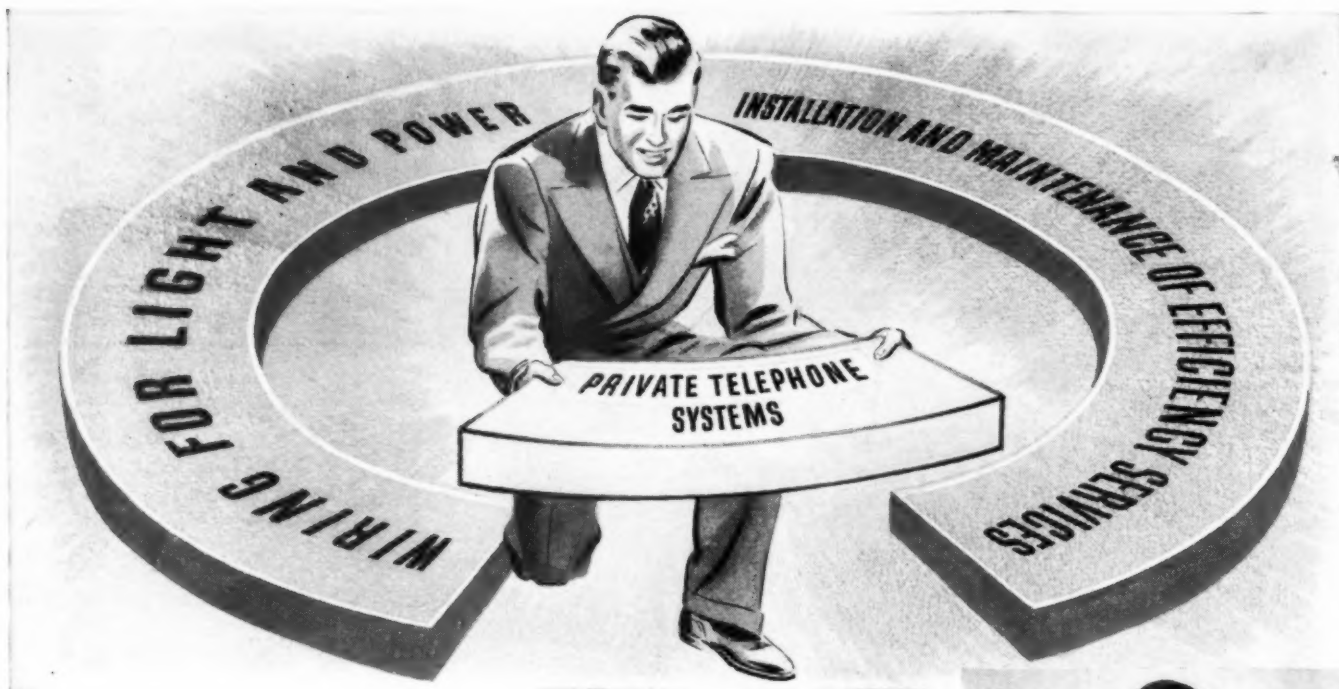
#### HAZARD INSULATED WIREWORKS

Division of The Okonite Company  
WORKS: WILKES-BARRE, PA.  
Offices in Principal Cities



# HAZARD

## Portable Cords & Cables



# Complete..

## YOUR PROFIT CIRCLE

### WITH THIS EASY-TO-GET BUSINESS

**W**ANT more sales, more profits? Then find out about the profit opportunities in Automatic Electric's intercommunicating systems. Many of your regular customers need private telephones now! The market is almost unlimited—homes, stores, schools, hospitals, small factories and shops, etc.

This source of extra business for you fits right in with your everyday work. There's an Automatic Electric intercommunicating system to meet every need. You can depend on their quality, because they are made by specialists in telephone equipment—the originators of the automatic dial telephone.

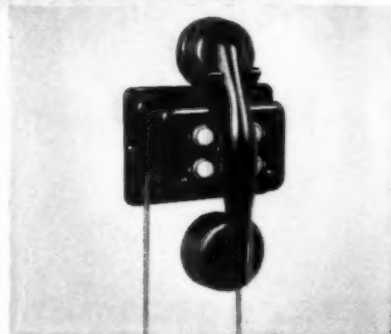
You'll profit from extra Private Telephone System sales. You'll have more customers—and more satisfied customers. You stand to profit on the labor and materials you supply, the equipment itself, and the leads you'll get to other business.

Ask your electrical wholesaler. If he cannot give you all the information you wish, write us direct!

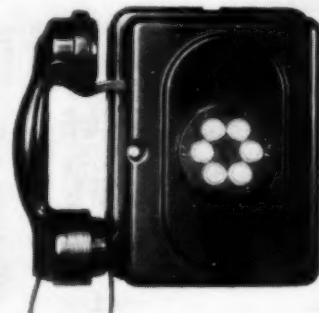
These systems are designed for private service. They are not intended to be connected with the public telephone system.



*See the Idealphone display at your wholesaler's. Try the Idealphone yourself—see how easy it is to install.*



**Idealphones**—Wall type with molded handsets—Offered with one or five buttons for common talking service up to ten stations.



**Intercoms**—Supplied in both desk and wall styles—with molded plastic handsets. Common talking systems of two to eleven stations.



**P-A-X's**—Automatic Interior Telephone Systems, providing dial service and secret connections for ten stations and up. Telephones in a variety of types.

# AUTOMATIC ELECTRIC

## PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois  
Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies Limited, Toronto

# Guth FLUORESCENT LIGHTING



BY GOLLY, MARTHY,  
I BELIEVE THEM  
CONTRAPTIONS IS  
HERE TO STAY!

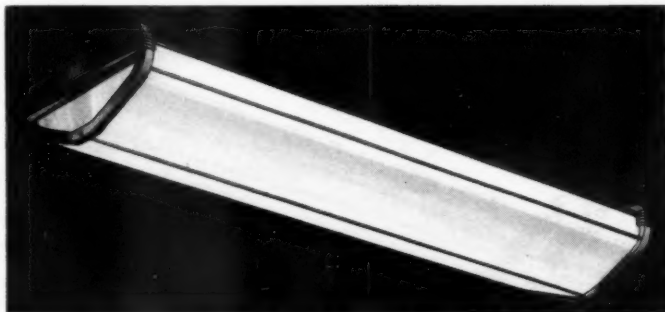


## Fluorescent Lighting Is "Here to Stay"— and It's YOUR Big Money-Making Opportunity!

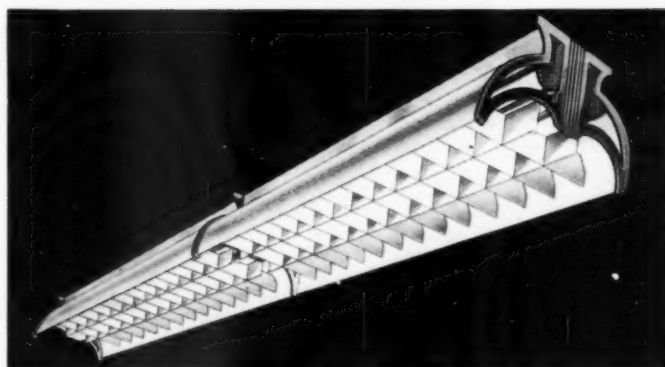
Fluorescent Lighting is out of the novelty stage. It's a sound, practical, highly efficient, economical method of lighting for offices, stores, and factories—a *proven* method that every businessman in your territory is interested in, wants to hear more about, *and will eventually install!*

So push Fluorescent Lighting. But be sure you

push the *best*. Push GUTH Fluorescent—the dependable fixtures backed by 39 years of successful lighting experience—fixtures scientifically engineered and styled—fixtures built and tested to the most rigid specifications. In short, the fixtures which thousands of businessmen acclaim as "Fluorescent Lighting's ONE Best Buy!"



GUTH Excelux



GUTH Surface Troffer

AL ZAK, the Kid with the  
Extra Punch Says: "ALZAK  
Resists Salt Spray!"

## Built Stronger to Serve Longer

GUTH Fluorescent is ruggedly constructed, has carefully tested High Power Factor accessories, and engineered permanent Reflectors. Inspection by the Underwriters' Laboratories, Inc., and frequent factory check-ups assure you the highest quality at the lowest cost. GUTH Fluorescent is the ONE BEST Fluorescent Buy!

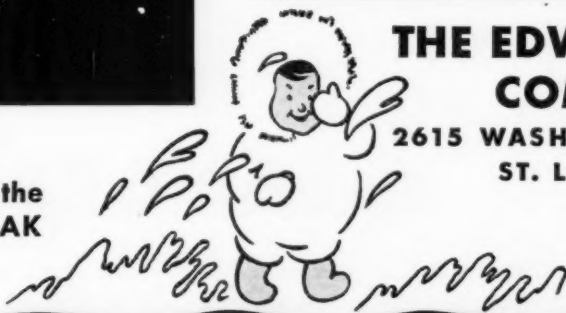
### GUTH HIGH BAY REFLECTORS

For engineered light-control in high-bay industrial areas, sell GUTH High Bay Reflectors. Made of aluminum, processed efficient permanent ALZAK, here is your best seller. Sell GUTH High Bays!

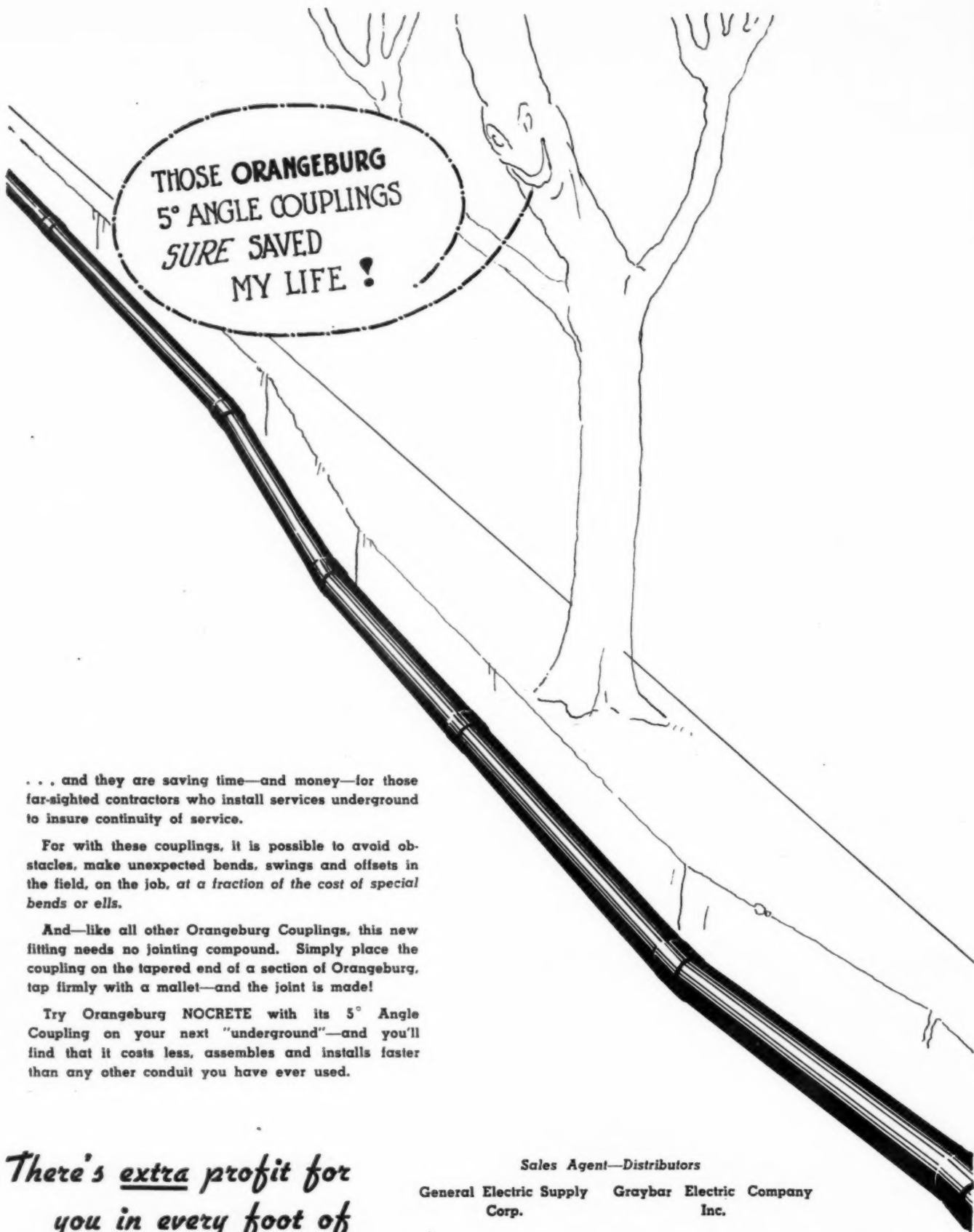


### THE EDWIN F. GUTH COMPANY

2615 WASHINGTON AVENUE  
ST. LOUIS, MO.



"LEADERS IN LIGHTING SINCE 1902"



... and they are saving time—and money—for those far-sighted contractors who install services underground to insure continuity of service.

For with these couplings, it is possible to avoid obstacles, make unexpected bends, swings and offsets in the field, on the job, at a fraction of the cost of special bends or ells.

And—like all other Orangeburg Couplings, this new fitting needs no jointing compound. Simply place the coupling on the tapered end of a section of Orangeburg, tap firmly with a mallet—and the joint is made!

Try Orangeburg NOCRETE with its 5° Angle Coupling on your next "underground"—and you'll find that it costs less, assembles and installs faster than any other conduit you have ever used.

*There's extra profit for  
you in every foot of*

Sales Agent—Distributors

General Electric Supply  
Corp.

Graybar Electric Company  
Inc.

## ORANGEBURG Conduits

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

**ORANGEBURG** NOCRETE for installation without concrete encasement  
Standard for installation with concrete encasement

# electrical contracting

With which is consolidated The  
Electragist and Electrical Record  
Established 1901

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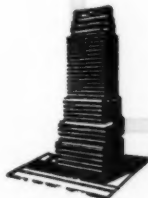
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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, and residential.

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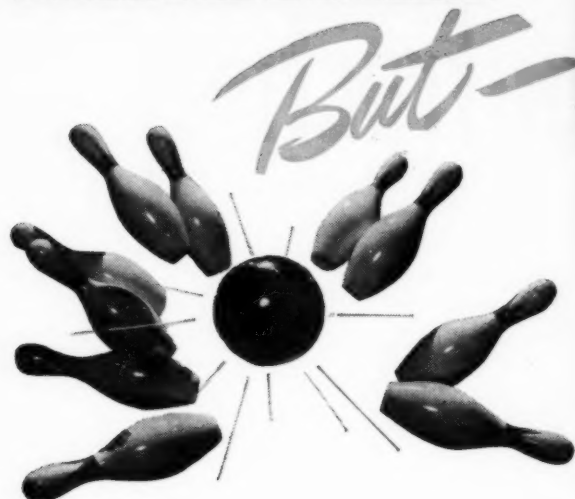
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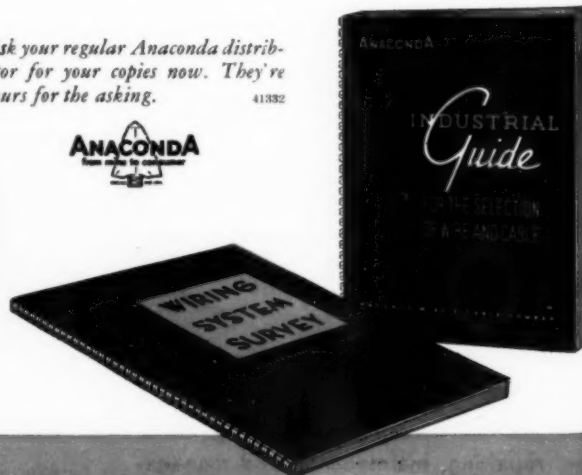
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**USE MODERN IMPROVED**

*Anaconda Wire & Cable*

JULY, 1941

## We Canaries

ONE OF MY FIRST JOBS as a wireman was in a jewelry factory. I worked with aching arms and a cricked neck, screwing cleats to the ceiling. Shafts squeaked, hangers rattled, pullies hummed, belts sang. And all day long, I whistled a gay obligato.

THAT NIGHT WHEN WE QUIT, the factory boss said to our foreman—"Hey you! Leave that damn canary bird behind tomorrow or we're gonna gag him." The man had no romance in his bosom.

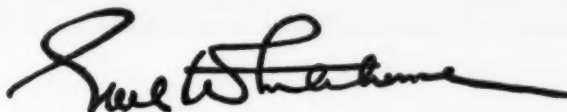
THANK GOD, I WAS BORN A CANARY. And most men are the same—down underneath. But outwardly they are reserved. While we canaries turn loose our enthusiasm, they hold back. That's all. And what a need there is right now for zeal and fervor!

OUR AMERICA IS GIRDING FOR WAR. Not just to help Great Britain. Not to impose democracy on anybody else. *Make no mistake!* We want to save our freedom. And we well know that should the British Empire fall, we would be pent up in a hostile world to fight alone.

BUT SO FAR UNCLE SAM'S GREAT DRIVE for Defense Production seems impersonal to most of us. We hesitate. We wait to be called. We cover the emotion in our hearts. We restrain our natural desire to be part of it. The canary in us does not sing. And yet we know right where we can contribute most. Why don't we go and do it?

THE TIME HAS COME NOW for each of us to play his eager part. And if you know one place in any factory where better light or power, control or wiring will speed the war work, boost production, cut the costs or help the workers, for God's sake point it out! Convince them! Show them how! Do the job for them! And put your heart in it!

AMERICA IS CALLING ALL CANARIES. Why don't we electrical men throw ourselves into this drive? Let our emotions rise! Turn loose our fighting spirit! Put our experience and knowledge to work! Together all we English-Speakers can stamp out this bloody German conquest. But let's do it now, all of us—not later and alone.



# Put this **ONE! TWO!** punch in your drive for **FLUORESCENT LIGHTING SALES!**



## **This NEW CATALOG tells what:**

GRAYBAR's new 86-page catalog illustrates more than 70 fluorescent fixtures for commercial and industrial applications from the lines of 9 top-flight manufacturers. It includes light output figures, distribution curves, dimensions,

specifications and list prices on all leading units. A convenient visible-index feature makes it easy to choose the fixture for any need. From this *one* book, your customers and prospects can make a broad-gaged selection of just what they want.

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## **This LIGHTING SPECIALIST tells how!**

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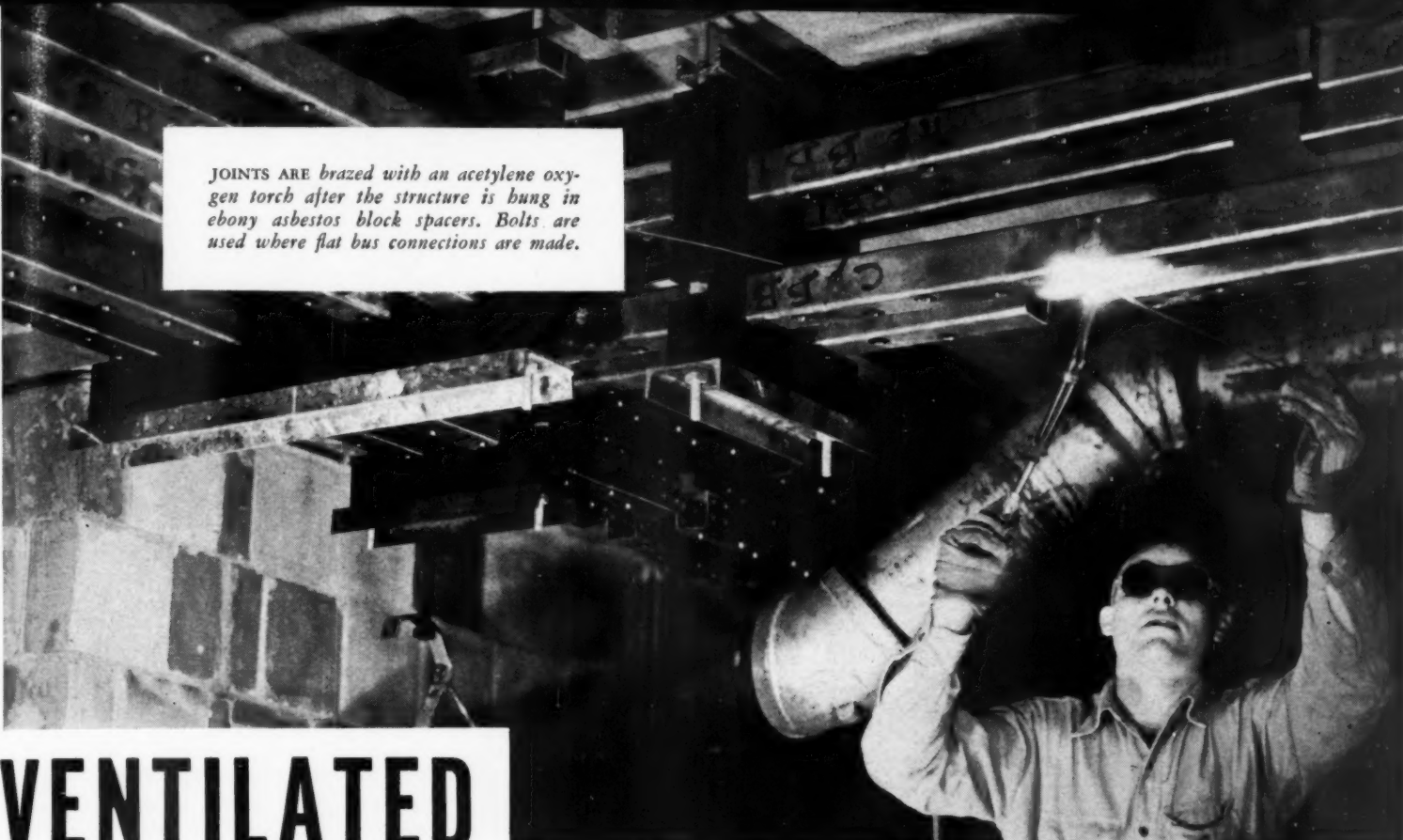
They are at your service to help you design or quote on small or large installations for offices, retail stores, public buildings or industrial plants.

When you need help on difficult-to-light industrial operations, especially, it will pay you to get in touch with GRAYBAR. Your local office can send a GRAYBAR lighting specialist to work with you on the problem.



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JOINTS ARE brazed with an acetylene oxygen torch after the structure is hung in ebony asbestos block spacers. Bolts are used where flat bus connections are made.

## VENTILATED

# BUS for System Feeders

Square tube busbar in a Transite enclosure economically serves light and power loads in new Chicago General Electric building. Brazed joints, welded corners, and intricate taps are some of the features. Some interesting experience for the contractor and industrial plant man.

**By Fred Olson and George Hamburger**

*Fries-Walters Electric Co. and Chase Brass & Copper Co., Chicago.*

It is to be expected that the wiring and electrical equipment of the General Electric Company's new office and service building in Chicago should be an example of fine modern engineering and design. However, some of the basic design problems and their solution are of distinct interest to electrical contractors and the electrical industry, because:

1. Similar problems of electrical distribution are encountered in all large commercial structures.

2. The methods employed proved practical, effective and thoroughly economical.

The many excellent features of the electrical equipment, lighting and wiring methods employed would be beyond the scope of an article of this length.

We feel, however, that the bus distribution system is, in its design and installation, worthy of description in some detail.

The building was erected by Holabird and Root for the General Electric Company. Among those who contributed to the specifications were W. B. Fowler of the General Electric Realty Corp., T. O. Millard of the General Electric Co. and the authors.

The general problem in selecting the distribution system was to provide a system with characteristics suitable for the kind of load and distribution encountered in a general office building with modern equipment, high level lighting and air conditioning. In addition, the system chosen had to meet certain specific requirements:

1. To tie two main secondary services together and connect to the load.

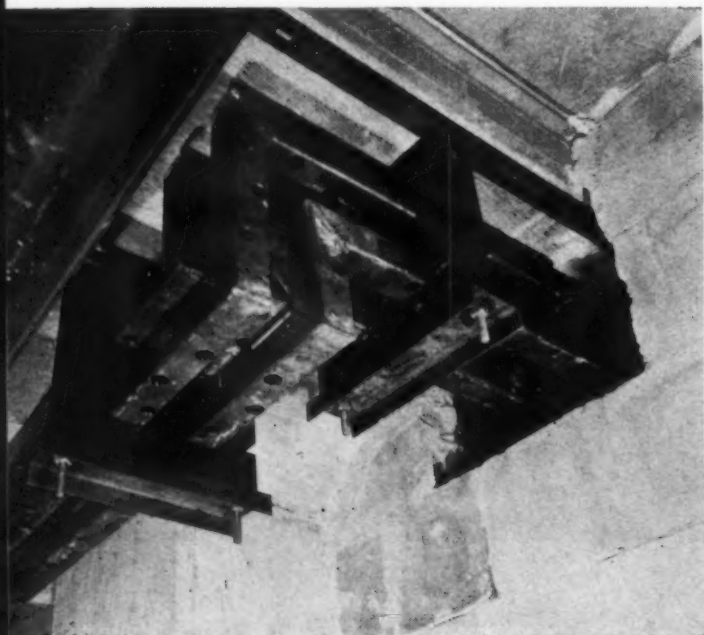
2. To provide wide diversity so that any reasonable concentration of load could be made without alterations to the main feeders.

3. To provide ample future capacity and to avoid excessive distribution losses.

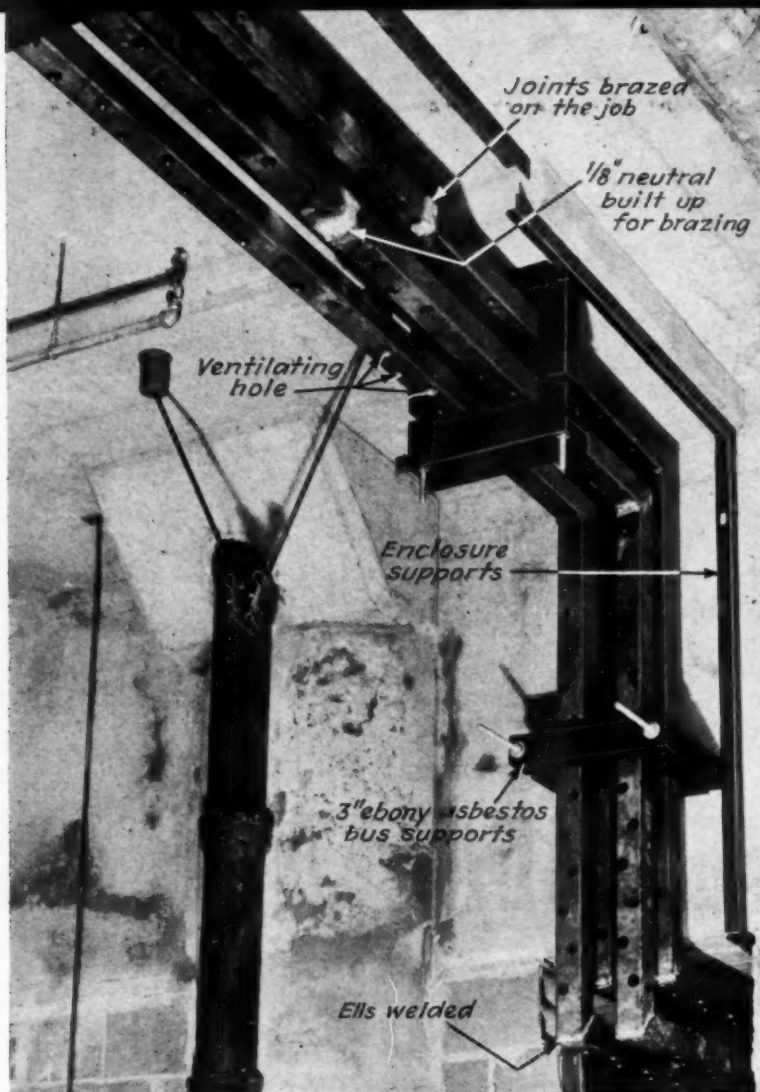
4. And to provide these features with maximum safety at low cost.

The electrical feeder system for the building consists of square tubular busbars installed to provide a continuous grid for light and power throughout the building. The grid consists of four 3-in. by 3-in. square copper tubes. Each phase conductor has a  $\frac{1}{4}$ -in. thick wall and the neutral is  $\frac{1}{8}$ -in. thick. The walls of the bus are perforated at short

BEFORE ENCLOSURE several of the features of the system may be noted as marked on photo at right. Ells are welded, joints brazed. Ebony asbestos supports provide insulation and support for bus and enclosure. Holes in bus and slots in supports provide ventilation.



TURN DETAIL showing the miter joint. The joints are welded. Pieces are factory made from detailed drawings.



intervals on all sides for thorough ventilation.

The busbars are set in a square pattern in ebony asbestos insulating supports. The system is enclosed within a Transite housing on steel frames, so arranged that normal air convection currents set up by even a small rise in temperature in the bus will rapidly remove any heat generated.

In general, the grid consists of four vertical risers, one to serve each quarter of the building, and a horizontal tie system, suspended on the basement ceiling between the four risers and the two main service switch gears.

The grid is provided with flexible expansion joints made of laminated copper straps. Expansion joints provided in all sections of the grid will allow an expansion of not less than two inches for 100 lineal feet of bus. Connections in the bus runs and final connections at the service switch gear are made with 4 by  $\frac{1}{4}$ -in. flat copper bars.

The vertical risers are supported by means of  $3\frac{1}{2}$ -in. thick, split ebony asbestos sections, mounted in an angle iron frame, anchored to the floor slab. Each bus has an angle foot brazed to the section where it extends through

the block. Supports are provided for each bus at each floor level throughout the riser.

The horizontal bus ties on the first floor and basement ceiling are supported on hangers made up of 3-in. thick ebony asbestos split sections supported on hangers consisting of 4-in. channel irons suspended on  $\frac{3}{8}$ -in. rod fastened in inserts imbedded in the floor above. The supports are spaced on 4- to 6-foot intervals and also provides fastening for the Transite enclosure. The ebony asbestos supports are also perforated for ventilation and cut and grooved on horizontal surfaces to avoid electrical leakage.

The entire bus grid is enclosed in  $\frac{1}{2}$ -in. thick Transite panel, readily removable and securely fastened to the asbestos supports by means of furniture bolt studs. All corner joints are bound with sheet metal angle strips.

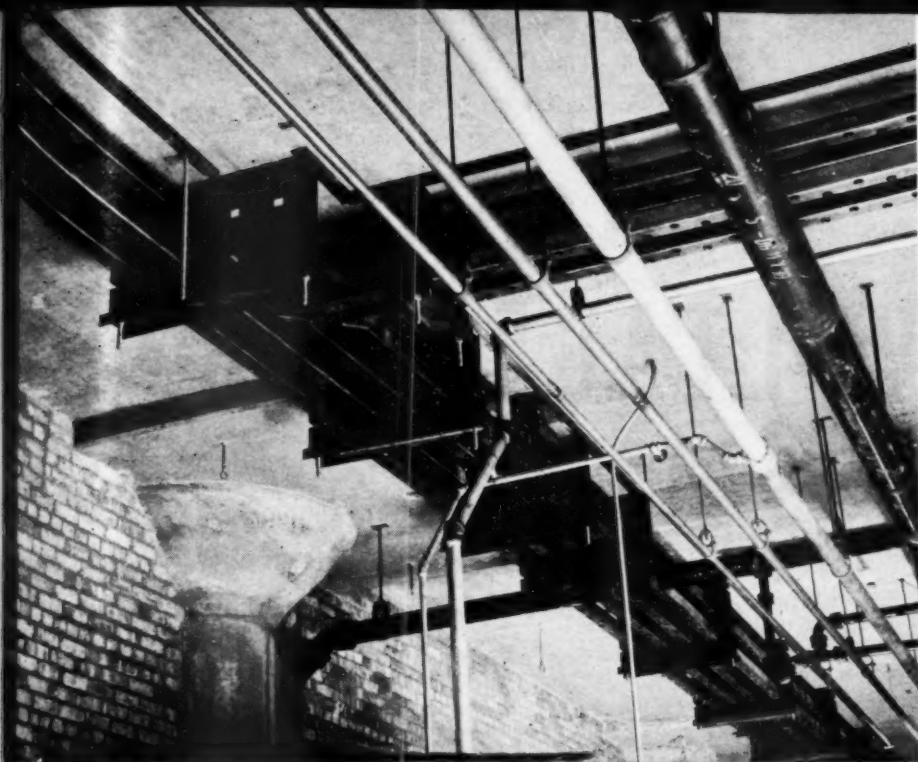
In the installation of the busbar, we use brazed joints worked with oxygen and acetylene gas welding torches. The bus handles much like  $3\frac{1}{2}$ -in. conduit for weight and rigging. On the horizontal work it was handled principally from rolling scaffolds. In brazing the  $\frac{1}{8}$ -in. thick neutral bus, we built

up the bus with short pieces of flat copper on two sides for greater mechanical strength at the joints.

In the installation of the bus, shop drawings were made of the entire square tube bus system showing each phase, all bends, length of bends, etc. Each piece of bus was marked in lengths that could be handled most easily and with fewest number of welds and brazes. Each piece was given a piece mark which indicated the phase, the section of the building and the riser feed or tie, such as "A phase Btl"—A phase in basement, tie bus, piece number 1 and so on. Risers were marked as R and indicated which riser, A, B, C or D, and where located.

Thus the copper, when received by the electrician, could be installed in its proper place with the least amount of time, confusion and a minimum waste. Variations, if any, were corrected at the expansion joints and the waste for the entire structure held to less than 1/100 of 1 percent of the total copper weight.

As will be noted from the illustrations, corners and taps offer some complication in construction when the "four square" bus pattern is used. The



*DOUBLE STRUCTURE is used where buses come together near vault terminals. One of the more difficult taps may be seen where a riser extends up from the right hand set of buses.*

square cross-section of the bus, however, minimizes the difficulty and offers many advantages. Corners are assembled on a simple 45 deg. miter bend. Expansion joints and circuit taps which must be extended in flat bars are readily fastened to the flat surfaces presented by the square duct.

The "four square" pattern approximates equidistant spacing of the phase conductors, and forms a relatively compact assembly. The square tube has many of the advantages of the more familiar round tube, such as mechanical strength and resistance to surge stresses, and in addition considerably simplifies the job of assembly.

The busbar system has a capacity of 2,800 amp. allowing for a 30 deg. rise at 100 percent power factor on 60 cycles. This figure, established for the bright unfinished bus, may be further increased 10 to 15 percent because the busbars were painted a dull black, which materially increases radiation of heat. The actual maximum demand of the building, however, is approximately 1300 kw.

At full load the line loss was considerably below one percent, so low, in fact, that regulation in the building could not be recorded on an ordinary curve drawing meter. The heat dissipating arrangement, the ventilated bus, supports, openings at the roof level and the type of insulation used are such that the safety limits extend far beyond the practical capacity of the system.

The building is fed from two 12,000-volt services at two points. In each of

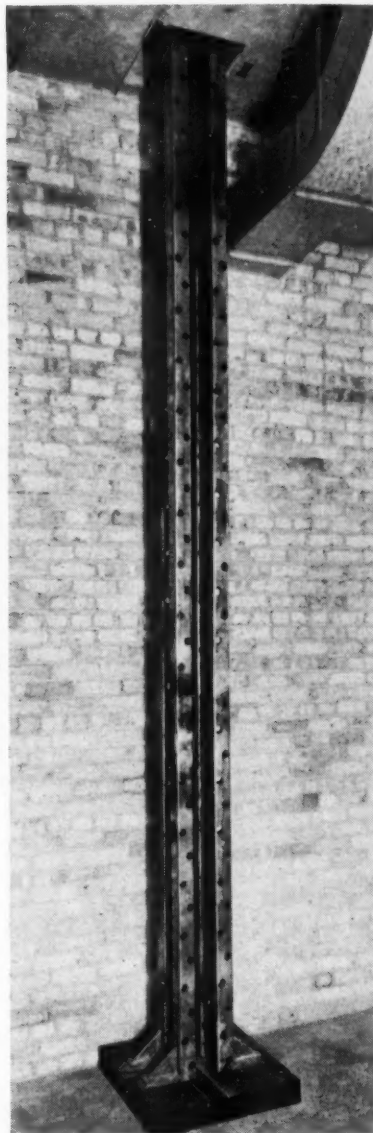
the two vaults there are two 750 kva transformers, providing 120-208-volt 3-phase, 4-wire current on the secondary buses. Each vault is equipped with facilities for two additional 750 kva transformers to double the present capacity. A main breaker at each vault feeds into the bus distribution system.

The vaults are so located that two bus risers terminate at each with the interconnecting bus tying the two together. Thus with both breakers closed and the system fed from both ends the interconnecting bus serves to equalize the building load over the two services. The diversity of the system is therefore limited only by the capacity of a single bus run, which approaches the installed transformer capacity.

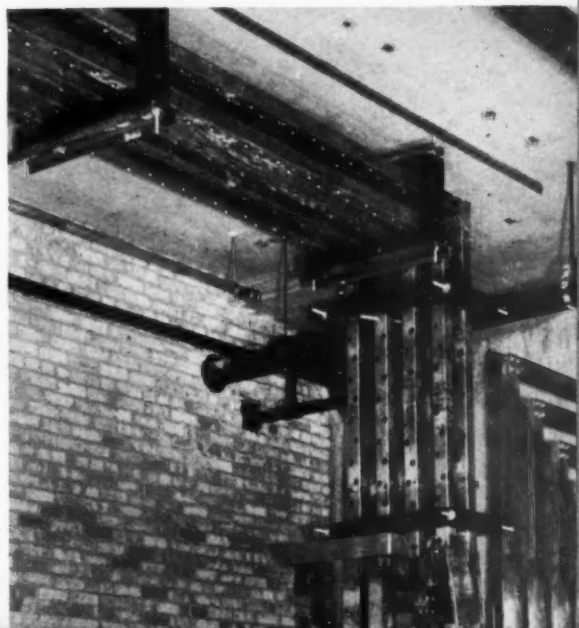
The main switch gear at each vault is a free standing, metal clad, safety dead front circuit breaker. Split Transite barriers are provided across the top to segregate the switch gear from the secondary bus tie closure. A separate segregated compartment is provided below the circuit breaker for the current transformers. The breakers have a capacity of 6,000 amp. each.

In conclusion, we should point out that while this system offers many advantages in diversity, engineering design and installation, as well as utilization, it is quite economical from the cost standpoint. Under the heavy loads and current of modern commercial buildings, it has proved quite favorable in comparison with other means of secondary distribution of equivalent capacity.

*TYPICAL RISER shows the method of supporting. At each floor the bus passes through a 3½-in. ebony asbestos block. Feet are brazed to each tubular bus.*



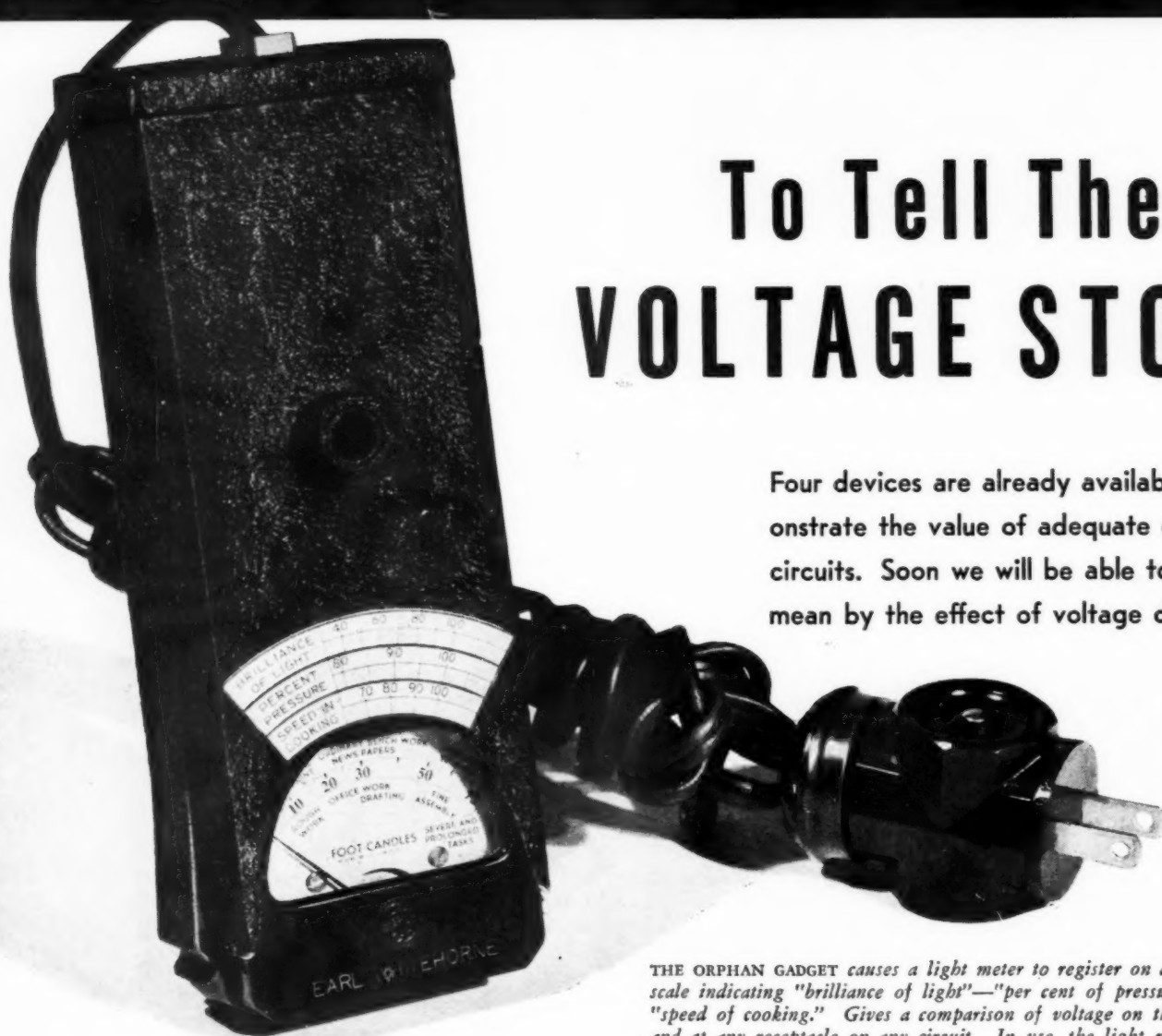
*TERMINAL CONNECTIONS of the square busbar at the switchboard are made with conventional busbar jumpers brazed to the box and bolted to the switchboard terminal.*



# To Tell The VOLTAGE STORY

Four devices are already available to help demonstrate the value of adequate copper in home circuits. Soon we will be able to show what we mean by the effect of voltage drop.

By Earl  
Whitehorne



THE ORPHAN GADGET causes a light meter to register on a special scale indicating "brilliance of light"—"per cent of pressure" and "speed of cooking." Gives a comparison of voltage on the meter and at any receptacle on any circuit. In use, the light meter fits in so its own scale is hidden.

**S**OME time ago I began preaching that you can't sell raw wiring. People don't want it, and making it cheaper won't do much good. For you won't buy something you don't want just because somebody cuts the price.

There are only three things about house wiring that hold any personal appeal to John and Mary. Here are these three facts—

1. If wires are too small, lights are less brilliant.
2. If wires are too small, cooking devices are slower.
3. If wires are too small, you lose money in energy wasted in heating circuit copper.

When you have said that, you have said it all. But those are all abstract statements that are not interesting to the average man and woman. The problem is how to demonstrate these three facts in a way that is interesting.

The whole thing, of course, hangs on voltage drop. If circuit wires are adequate, you get full voltage, full bril-

liance of lights, full speed in toasters, percolators, radiators, full efficiency. But the thing to be demonstrated is not *voltage drop*. What must be demonstrated is these three things that happen when wires are not big enough.

A little while ago there was no way to do this. Now four devices are available to the electrical contractor to help tell his story. All four are useful. They are—

**1. The Square D Gadget**—To help contractors sell their multi-breakers, the Square D Company of Detroit has developed a gadget. It is a box containing a transformer, so connected that the demonstrator can show the effect of low or proper voltage by the dimness or brilliance of three little flashlight bulbs. It also shows a cut-away of a multi-breaker, which is operated automatically or manually to indicate what happens in circuits that become overloaded.

The contractor explains this in terms of brilliance of light, speed of cooking and waste of money. This money waste is easy to calculate on the chart developed by Walter Collins of Chicago (see *Electrical Contracting*, May 1938). It shows prac-

tically a three per cent waste of money for every drop of one volt.

Many of these Square D demonstrators have been sold to contractors and are being used successfully by them. They are showing John and Mary the value of installing enough copper when the house is built to deliver full voltage, no matter what appliances are used.

**2. The Smedley Gadget**—This shows the effect of inadequate wiring on electric lamps for any circuit length from 10 to 300 feet, for any wire size from No. 14 to No. 0. It is shown visually and on a calibrated dial. It permits the contractor himself to decide wire size and circuit length without figuring, as well as provides him with a way to demonstrate it to his customer.

Each lamp represents a 400-watt load on No. 14 wire, the sum of them a 1600-watt load. The number of watts required at full voltage to produce the same brightness is indicated. A push button gives a quick comparison between the circuit demonstrated and full voltage. This device was developed by A. B. Smedley of the Anaconda Wire and Cable Co.

**3. The Bissell Gadget**—In Akron, G. E. Bissell, of the Ohio Edison Com-

pany, and now in the Army, has also developed a demonstrator that shows the advantage of No. 12 wire over No. 14, with loads running up to 30 amperes. The demonstration blows out a 15 ampere fuse. You then replace it with a 30, at 100 per cent over load, and the heat in exposed sections of bare wire can be felt with the fingers. The device houses a transformer, ammeter, switch, receptacle and four 32 candle power lamps. R. A. Ries of Ohio Edison Company has it now in hand.

**4. A Light Meter Gadget**—My idea has been to show John and Mary in their home that the "pressure" of the electricity falls off between the meter and the outlet upstairs. To demonstrate this, I had a gadget made by hand. It is just a box with a light in it that shines through a hole upon the sensitive end of a light meter. The size of the hole is adjustable by turning a knob that operates a shutter. On the box is a special scale reading in "Brilliance of Light"—"Percent of Pressure"—"Speed of Cooking."

You plug this gadget into the outlet nearest the meter and adjust the light volume so the needle points to 100 per cent. Then you go upstairs and plug into any outlet. And each time, you throw in a 1000 watt load by plugging a flatiron into a current tap attached to the cord connecting the gadget.

In my house on the third floor, I get 95 per cent "pressure," 82 per cent "brilliance of light" and 90 per cent "speed of cooking." And that ought to make anybody want better wiring. This device is not on the market but can be made up by anybody who wants to. I have a few samples available—though the picture tells the story.

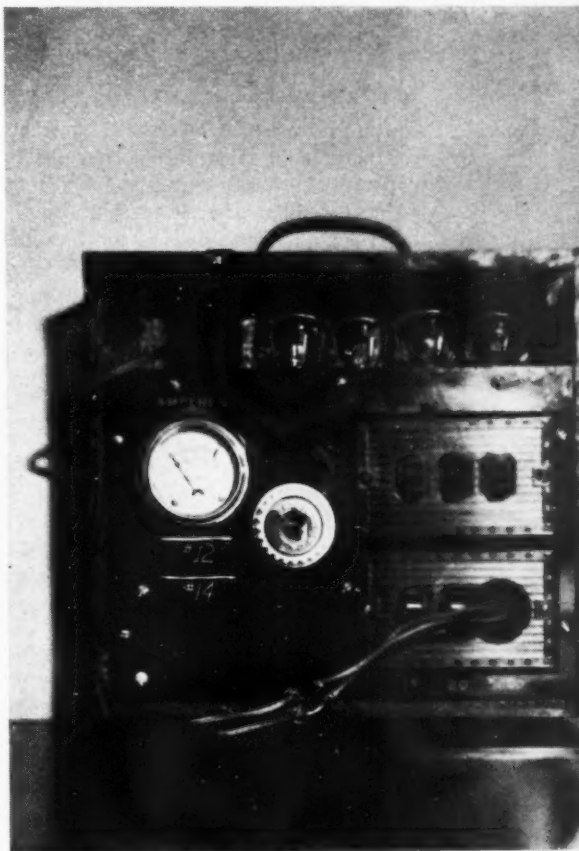
Voltage drop is becoming steadily more important in the selling of wiring, the building of the greater market for electricity. In factories and commercial buildings the new small diameter wire focuses interest on voltage, by offering a cure. So here as well as in homes, this voltage drop story must be made plain.

To do this we need a simple demonstration and these devices offer several approaches to it. Out of these four gadgets a satisfactory demonstrator may evolve. The need will create a demand. More such gadgets will come till we have what we need.

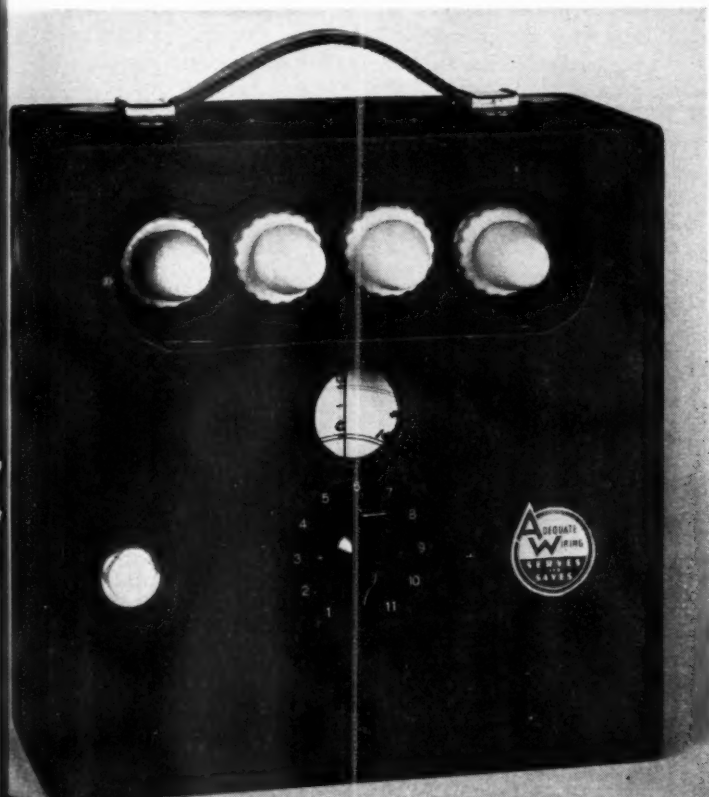
In the beginning, some power companies were nervous for fear any discussion of voltage would lead to misunderstanding and trouble over their secondary voltage regulation. These fears are gradually dying, however. A number of companies are now talking to the customer about the importance of avoiding voltage drop in his wiring systems.

This is sound, because the trouble centers in tight wires between the meter and the convenience outlet. The public does not think about secondary voltage at all. But people are interested in brilliance of light and speed of cooking. That spells comfort. They are interested in waste of money. And many families will have their wiring modernized to correct these troubles, if they know about them.

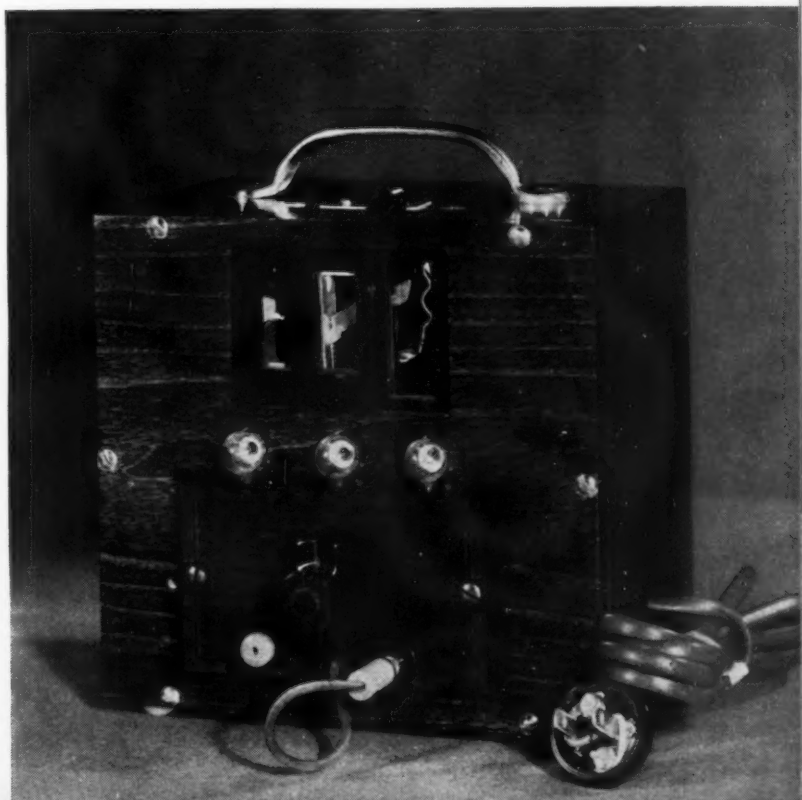
**BISSELL'S GADGET**—It demonstrates the advantage of No. 12 over No. 14 wire. It blows a 15 ampere fuse and lets you feel the wires heat up, when you substitute a 30 ampere plug. Four lamps indicate the effect of voltage drop.



**SMEDLEY'S GADGET** shows the effect of inadequate wiring on four lamps that can represent No. 14 to No. 0 wire and circuits from 10 to 300 feet long. Helps the contractor decide wire size.



**SQUARE D'S GADGET**—devised to help sell multi-breakers, through demonstrating the effect of voltage drop by affecting the brilliance of little lamps.



# WIRING FLUORESCENT C

**A**LTHOUGH the present trend is toward factory wired fluorescent fixtures, some day in the near future some electrical contractor or plant man is going to be called on to replace burnt out auxiliary units. And he should know what units that particular fixture requires and how they should be connected in the circuit. Also, in some cases, it might be more practicable to have the fixtures come unwired and mount the auxiliary equipment entirely separate from the fixture proper.

To clarify control wiring of fluorescent units, we present this brief discussion of the auxiliaries needed for each type of fixture, together with its wiring diagram. The wiring diagrams illustrated are standard with respect to essential connections, but the color coding of the auxiliary leads may vary slightly with the products of different manufacturers.

The lamp starter is of course necessary for all types of fluorescent lamps. It is usually mounted in the lamp socket and its size depends on the size of lamp used. The type of ballast used depends on the number of lamps in the fixture, their wattage and the circuit voltage. They are connected as follows—

**1. Single Lamp Units** with 15- or 20-watt lamps on 110-125 volt circuits, or 30- and 40-watt lamps on 220-250 volt circuits have a ballast composed

of an ordinary reactor and a capacitor for high power factor. For operation of 30- and 40-watt lamps on 110-125 volt circuits the ballast also contains a step-up transformer. Connections for these units are shown in Diagram 1.

**2. Two Lamp Units**, in general, require a ballast containing two reactors and a capacitor for high power factor and to reduce the stroboscopic effect. This is all that is necessary for 15- and 20-watt lamps on 110-125 volt circuits. For two-lamp operation of 30- and 40-watt lamps on all circuits, an additional starting compensator is necessary; one for each two-lamp ballast. It is wired in series with the reactor-capacitor circuit of the "leading current" lamp. Omission of it will delay lamp starting and shorten lamp life.

These compensators are either built into the ballast or furnished as a separate unit. Operation of 30- and 40-watt lamps on 110-125 volt circuits requires, in addition to the above, a step-up transformer which is built into the ballast. Connections for each of these cases are shown in Diagrams 2, 3, and 4.

**3. Three Lamp Units** or other multiple-lamp units utilize a combination of two-lamp and or single lamp ballasts with starting compensators and step-up transformers as required by lamp size and circuit voltage. A picture of typical connections for a three- and four-lamp unit is shown in Diagrams 5 and 6.

**4. Phase Distribution** for multiple lamp units is illustrated in Diagrams 7 and 8, which show the connection for three-lamp units, using single-lamp high power factor ballasts, on a three-phase, three-wire and a three-phase, four-wire system.

**5. Direct Current** operation of fluorescent lamps requires the addition of a special resistor in series with the line connection to the special d.c. auxiliaries. The conventional glow switch will not operate on d.c. circuits. Typical connections are in Diagram 9.

The wiring diagrams reproduced here were developed from information gathered from manufacturers of fluorescent lamps and auxiliaries. They should be helpful to electrical men who install and service fluorescent fixtures.

DIAGRAM 5. Connections are for operation of three 30- or three 40-watt lamps on 110-125 volt circuits, using a combination of one twin lamp 4-wire ballast with step-up transformer, one single lamp ballast and a separate starting compensator. If compensator were built-in, the twin lamp ballast would have six leads.

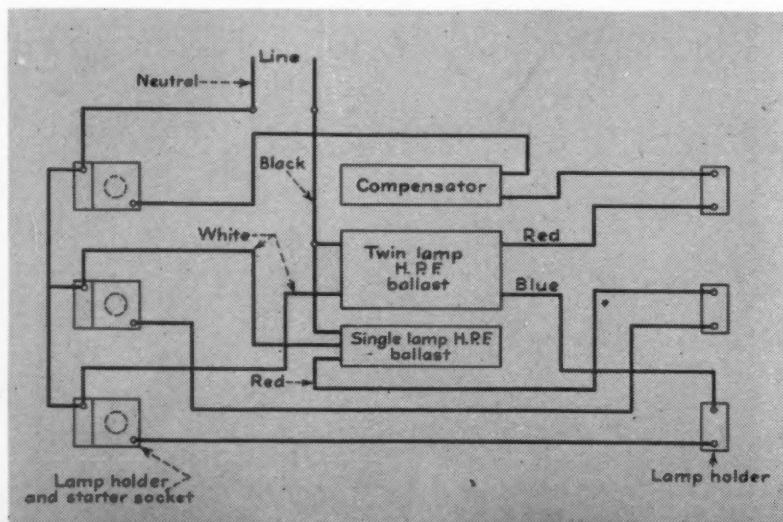
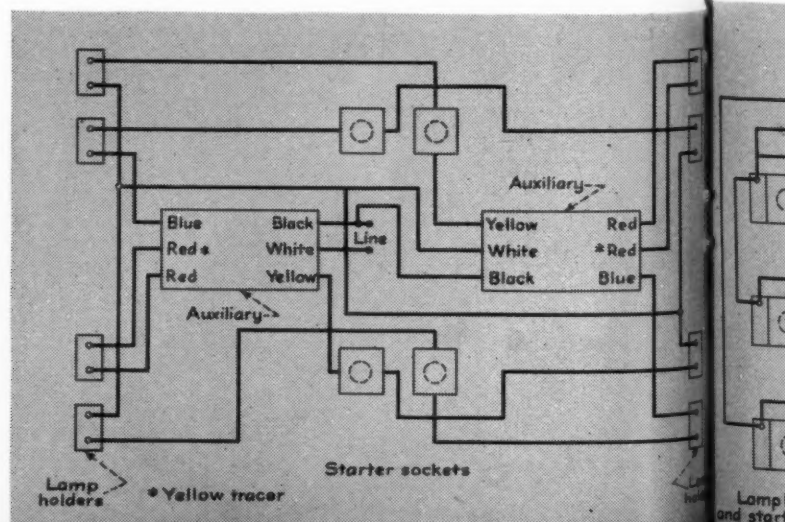


DIAGRAM 6. Connections are for operation of four 30- or four 40-watt lamps on 110-125 volt circuits, using two high power factor, six-wire, twin lamp ballasts. These auxiliaries, one for each group of two lamps, contain built-in step-up transformers and starting compensators in the "lead lamp" circuit.



# CONTROLS

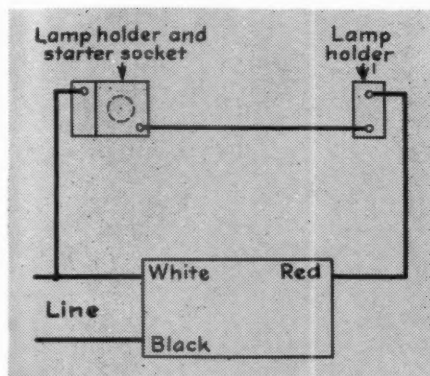


DIAGRAM 1. Connections are for single lamp operation of 15- and 20-watt lamps on 110-125 volts and 30- and 40-watt lamps on 220-250 volts, using a high power factor ballast.

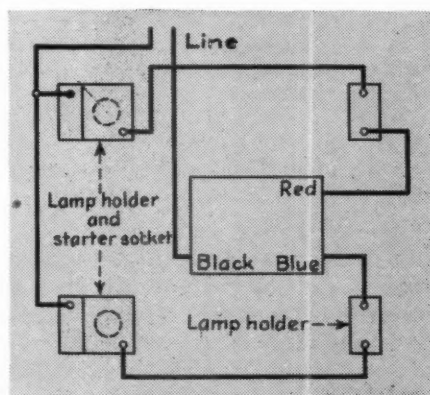


DIAGRAM 2. Connections are for operation of two 15- or two 20-watt lamps on 110-125 volts with a two-lamp high power factor ballast.

DIAGRAM 7. Connections are for operation of three 30- or three 40-watt lamps on a three-phase, three-wire circuit, using three single lamp high power factor ballasts. Same connections apply to operation on either 110-125 or 220-250 volts, the difference being in the ballast which contains a built-in step-up transformer.

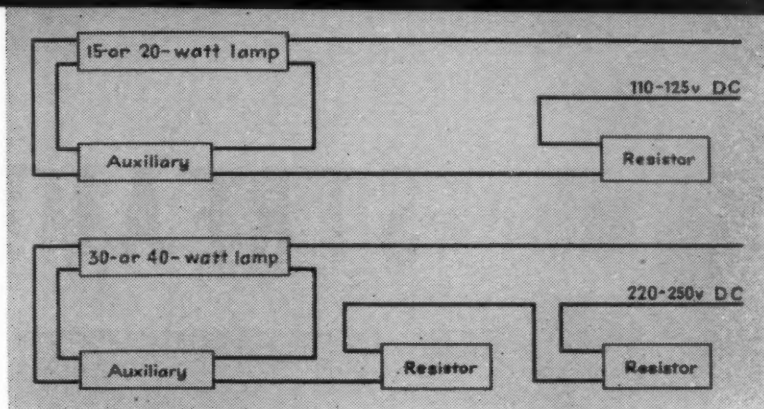
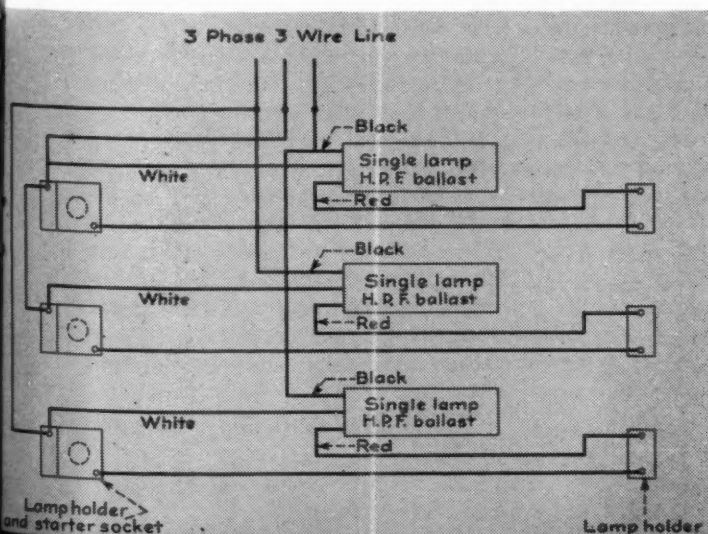


DIAGRAM 9. Connections are for operation of 15- or 20-watt lamps on 110-125 volt d.c. circuits, using a special d.c. auxiliary and one resistor in series with it; also for operation of 30- or 40-watt lamps on 220-250 volt d.c. with auxiliary and two resistors.

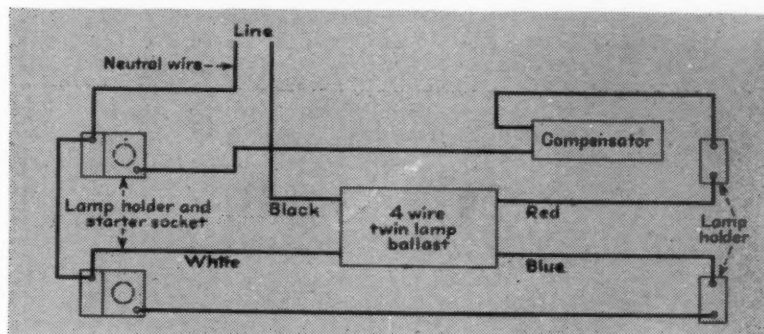


DIAGRAM 3. Connections are for operation of two 30- or two 40-watt lamps on 110-125 volt circuits, using a 4-wire two-lamp ballast containing a built-in step-up transformer. Starting compensator in the "lead" lamp circuit is a separate unit.

DIAGRAM 4. Connections are for operation of two 30- or two 40-watt lamps on 220-250 volt circuits, using a 3-wire two-lamp ballast with separate starting compensator. If the compensator were built-in, the ballast would have five leads.

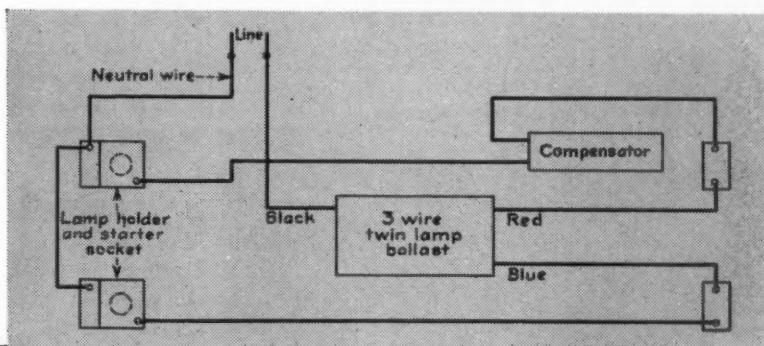
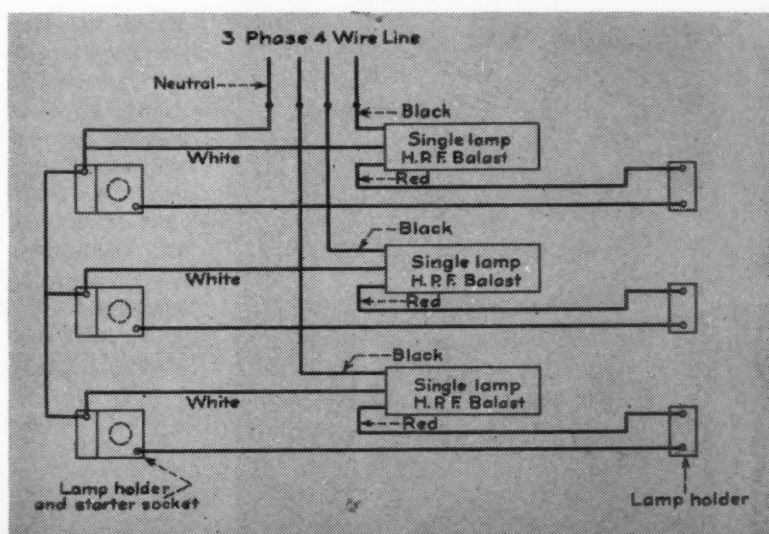


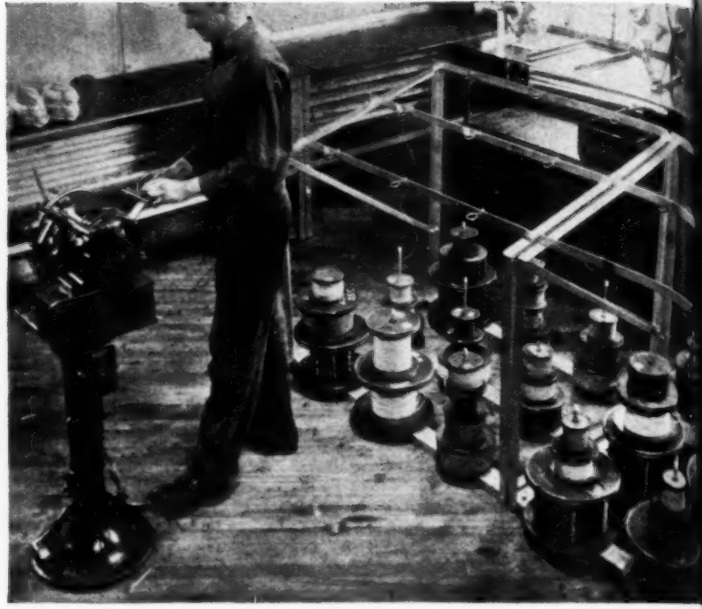
DIAGRAM 8. Connections are for operation of three 30- or 40-watt or three 15- or 20-watt lamps on a three-phase, four-wire circuit, using three single lamp, 3-wire high power factor ballasts. For operation of the larger lamps on 110-125 volts the ballasts contain built-in transformers.



# STREAMLINING SMALL M



STRIPPING AND CLEANING are confined to one corner of the department, immediately following the disassembly table. Coils are cut and removed on one machine.



UNREELER RACK stores the active magnet wire reels. It is located directly behind the winding heads and feeds the magnet wire to the winding machines.

INSULATION MATERIALS are stored and cut on this table made from two standard metal tables, back to back. Both fibre insulation and sleeving are cut here.

**A**S modern cars and planes are streamlined to increase speed, so the modern small motor repair department must be streamlined—if profits are to be realized. Waste motion must be eliminated and proper equipment installed before unit costs go down and profits begin to show.

With this in mind we spent about six months studying departmental arrangements, visiting other shops and planning. Every operation was carefully analyzed on paper before work was actually started. We knew that success in small motor repairs depended on:

1. Careful planning
2. Time saving equipment
3. Proper departmental arrangement
4. Properly trained employees
5. Efficient and adequate supervision

Based on these fundamentals, we planned our shop layout and being satisfied that it would do the trick, we went to work on it. Now we have a self-contained repair department in which every operation necessary to recondition motors from  $\frac{1}{2}$  to 5 hp. is done within its confines.

The features of the new small motor repair department, all add up to in-

creased production, quality workmanship, lower unit costs and increased profits. They are—

1. *Self-Contained*—The department receives the job "as is" and when it leaves it is completely repaired, finish-tested and ready for delivery to the customer. Current materials and parts are stocked within the department, with reserve stocks of some of the materials in the general shop stock room. The workmen are trained in every skill required for all types of operations involved. In case one man is out, production will not be slowed up.

2. *Continuous Line Production*—The job progresses through the department from first inspection to finish painting with no backtracking. Motors are handled on standard 2-ft. by 5-ft. metal table tops, 36-inches high, which encircle the entire department. If a job stalls, for any reason, it is placed on storage shelves beneath the tables.

Disassembled parts are placed in a perforated metal tray which is identified by a duplicate of the tag placed on the motor frame. Nothing is allowed to interfere with the progress of the stator from start to completion of the job. Incoming job storage, tool and parts storage, coil making, insulation cutting, mechanical repairs, and outgoing job

Abstract of a paper presented before the recent convention of the National Electrical Service Association in Buffalo.

# MOTOR REPAIRS

Careful planning, straight-line production and modern equipment were combined to form this small motor repair department. Result—small electric motor repairs cost less.

By Frank Willey,

Willey-Wray Electric Co., Cincinnati, Ohio

## Repair Time Schedule for Small Polyphase Motors

TIME IN HOURS

	Speed H.P. R.P.M.	Check Disas. Strip Clean	Make Coils Cut Insul.	Wind Connect Dip Bake	Assem. Test Finish Paint	Total
1/2	3600	3/4	1 1/4	3 1/2	1 1/2	7
	1800	3/4	1 1/4	3	1 1/2	6 1/2
	1200	3/4	1 1/4	3 1/4	1 3/4	7
	900	3/4	1 1/2	3 1/2	1 3/4	7 1/2
3/4	3600	3/4	1 1/4	3 3/4	1 3/4	7 1/2
	1800	3/4	1 1/4	3 1/4	1 3/4	7
	1200	3/4	1 1/2	3 1/2	1 3/4	7 1/2
	900	1	1 1/2	3 1/2	2	8
1	3600	3/4	1 1/2	4	1 3/4	8
	1800	3/4	1 1/2	3 1/2	1 3/4	7 1/2
	1200	1	1 1/2	3 1/2	2	8
	900	1	1 3/4	4	2 1/4	9
1 1/2	3600	1	1 1/2	4	2	8 1/2
	1800	1	1 1/2	3 1/2	2	8
	1200	1	1 3/4	4	2 1/4	9
	900	1 1/4	1 3/4	4 1/4	2 3/4	10
2	3600	1	1 3/4	4 1/2	2 1/4	9 1/2
	1800	1	1 3/4	4	2 1/4	9
	1200	1 1/4	1 3/4	4 1/4	2 3/4	10
	900	1 1/4	2	4 1/2	2 3/4	10 1/2
3	3600	1	1 3/4	4 3/4	2 3/4	10 1/4
	1800	1	1 3/4	4 1/4	2 3/4	9 3/4
	1200	1 1/4	2	4 1/2	2 3/4	10 1/2
	900	1 1/4	2	5	2 3/4	11
5	3600	1 1/4	2	5	2 3/4	11
	1800	1 1/4	2	4 1/2	2 3/4	10 1/2
	1200	1 1/4	2	5	2 3/4	11
	900	1 1/4	2 1/4	5 1/2	3	12

storage are in the center of the department or outside the production line.

3. *New Equipment*—Every piece of equipment in the department is new. Some of it was purchased and some was built. All equipment is of smaller size to fit the work. Even metal stools now replace the old wooden ones. The operations improved by the use of new equipment are stripping, cleaning, coil making, using Formvar wire, unreeling of magnet wire, dipping and baking by infra-red heat.

4. *Working Conditions*—The department is orderly. Nothing but table legs and equipment supports are on the floor. No jobs or job parts are permitted on the floor, which is swept daily or more often if required. All process dirt is confined to the stripping and cleaning corner. There is no flame required and cleaning fluid and baking varnish are limited to seven gallons each.

With the streamlined small motor repair department that we now have, it is possible for us to do straight rewind jobs in accordance with the accompanying time schedule. The total time required to rewind each size and speed of motor is broken down into four subdivisions—

1. Strip and clean parts
2. Make coils
3. Wind stator, connect, dip and bake
4. Assemble, test and finish paint

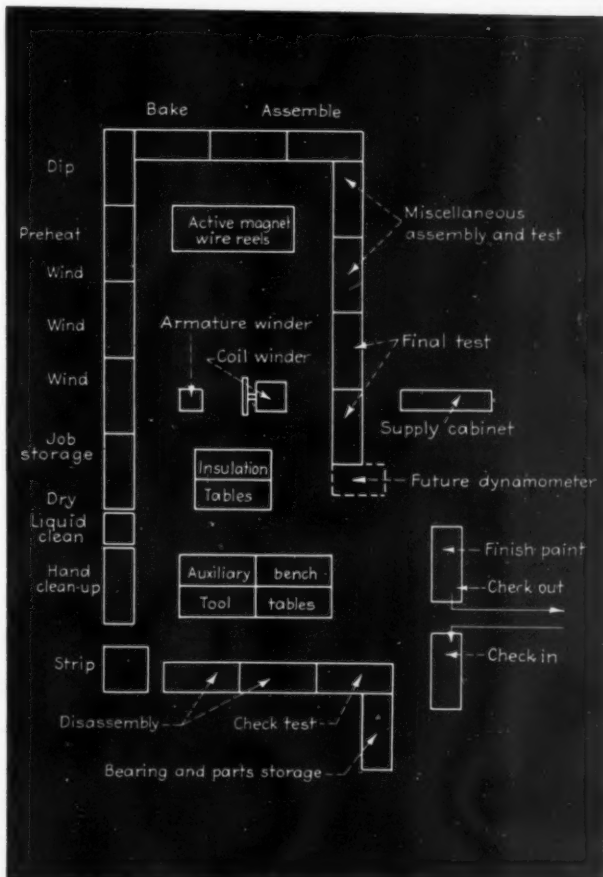
Some may think certain of our time allowances are inadequate, but they are all possible. They should be used as objectives—for this schedule provides a profit. Although we have been operating this new department for about four months, the time reduction has not been too great. But this is to be expected, since the equipment and routine are new to the men. They must become accustomed to it. When we get into high gear, we expect to chop 40 per cent off the time previously required to do these jobs.

Some may think this set up costs a lot of money. Well, not too much. To date we've spent about \$2700 and when complete it will be about \$3500. But, like all business, you've got to spend money to make money, especially in this small motor repair work.

With inadequate equipment and inefficient shop layouts, you can't battle the time element, reduce unit costs and do volume work. But a modernized small motor department, separate from the rest of the shop, pays big dividends.



DIPPING TABLE is made from a standard 2-ft. by 5-ft. metal table with a covered dipping tank at one end. It is between winding tables and bake oven.



DEPARTMENT LAYOUT showing the straight line production system encircling the department. Coil winding and parts storage are out of production line.

# FLUORESCENT Gymnasium Lighting

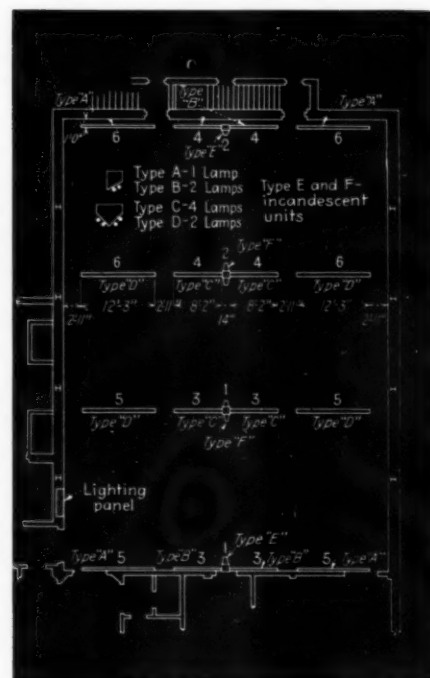
Fluorescent lighting for general purposes, combined with special batteries of incandescents for badminton, make this Providence gymnasium the best lighted indoor court in New England

"WE want the best lighting possible for the job at hand." That was the verdict of the Providence, Y.W.C.A. authorities when they built the new gymnasium designed by Jackson, Robertson and Adams, local architects.

Although the original layout was for fifteen 500-watt high bay prismatic incandescent units, Karl A. Piez, illumination design engineer for the Crooker Co., who furnished the equipment, went to work and developed an operating cost analysis of incandescent versus fluorescent lighting. In spite of the somewhat higher original cost of a fluorescent system, the answer came out—more foot-candles and at a lower total annual operating cost per foot-candle of illumination. So the fluorescent lighting system was installed by the Electric Maintenance and Equipment Company of Providence.

General lighting for this 75-ft. by 53-ft. 8-in. gym is provided by 16 bare-lamp fluorescent units using 40-watt lamps and mounted on the under side of the roof trusses, 22 feet above the floor. Four of the units contain eight lamps each; four contain six lamps each; four have four lamps each and four have three lamps each. The reflecting surface is baked white enamel. Four specially designed 500-watt incandescent auxiliary units with prismatic lenses are mounted parallel to and above the center line of the badminton nets. They provide a concentrated 3-ft. beam of light over the length of the nets.

The fluorescent units are mounted parallel to the width of the gym and so located as to be at the sides of the three badminton courts. A total of six circuits and switches control all the gym lighting, four for the fluorescent



PLAN VIEW of the gymnasium showing the type and location of the lighting units and the circuiting used for various purposes. Units are mounted parallel to courts.

and two for the incandescent. The circuits are so arranged that two switches control the fluorescent units for half the room, plus a third switch for two of the incandescent units. The accompanying drawing of the lighting layout indicates the type of unit and the circuit to which it is connected.

For general gymnasium use all fluorescent units are used. This includes circuits 3, 4, 5 and 6. For badminton the center fluorescent circuits 3 and 4 and the incandescent circuits 1 and 2 are used. This arrangement provides light where it is most needed for this sport.

The illumination intensities provided by this lighting system, after approximately 300 hours operation, average 18 foot-candles for general gymnasium use. For badminton, using the circuits mentioned, the intensities range from eight foot-candles at the base line to 18 foot-candles at the net. Turning on the incandescent "boats", as they are called, adds another eight foot-candles of concentrated light at the net line.

No appreciable glare is experienced from the bare lamp fixtures, since they are mounted at a 22-ft. height and soft white lamps are used. The general opinion of the Y.W.C.A. authorities and all who have used the gym, especially badminton experts, is that it is the best lighted set of indoor courts in the New England States.

GYMNASIUM LIGHTING with fluorescent lamps and special incandescent auxiliary units makes this Y.W.C.A. gym the outstanding badminton center in New England.



# Cutler-Hammer Service Control

## "the line that has everything!"

**Appearance**—The simple, effective styling of the C-H line is modern in every respect. This permits installation in any location without objectionable appearance.

**Ease of Installation**—Many time saving features are incorporated. Easily removable interiors; approved solderless connectors; large number of conveniently located, well cut, conduit knock-outs and one screw cover fasteners are but a few of the many details designed to save time and installation costs.

**Reliability**—All devices are of dead front construction for complete safety to the customer and bear Underwriter's approval. They are designed to meet fully the installation requirements of the National Electrical Code.

**Availability**—The complete C-H line embraces every needed type to meet the individual requirements of any community. Available from C-H wholesalers' stocks everywhere.

**THE** Cutler-Hammer Line of Service Control has everything you want, everything you need . . . everything that makes sense to practical electrical men and puts dollars in their pockets. Look at the features of C-H Service Control on this page. Compare them with others any way you like. You'll find the Cutler-Hammer Line's way ahead in every way. Carry and feature the line that has world-famous dependability . . . ready acceptance to your trade. Line up with Cutler-Hammer. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto.

At Left:  
C-H  
Bulletin  
4302-H3

At Left:  
C-H Bulletin  
4334-H15

At Right:  
C-H Bulletin  
4334-H15

Below:  
C-H Bulletin  
4302-17

Below:  
C-H Bulletin  
4345-H1

At Left:  
C-H Bulletin  
4302-H17

At Right:  
C-H Bulletin 4336-H1

At Right:  
C-H Bulletin  
4302-H13

At Right:  
C-H Bulletin  
4302-H2

At Right:  
C-H Bulletin  
4302-H14

Above:  
C-H Bulletin  
4336-H2

At Left:  
C-H Bulletin  
4334-H22

**Types**—This modern switch line includes devices for either flush or surface mounting; for indoor installation or in rain tight enclosures for outdoor use; fusible or fuseless mains; with or without branch circuit facilities—in all ampere capacities.

**Finish**—Well baked, durable, corrosion resistant aluminum finish, standard on all enclosure cases for indoor installation. Flush type devices have a pleasing, well baked, gray enamel flush plate and rain tight cases and weather proof devices are zinc plated to give enduring protection against corrosion.

**To Meet Present Day Demands**—All C-H devices are packed in individual shipping cartons, clearly labeled for ready identification. Individual wholesalers' stocks are backed by adequate C-H warehouse stocks located at convenient points throughout the country—insuring quick delivery to you.



**LINE UP WITH CUTLER-HAMMER!**

# YOU'LL GET MORE BUSINESS

A black and white photograph showing a hand holding three GE Mazda lamps. The lamps are positioned diagonally across the frame, with their bases at the bottom left and their tips pointing towards the top right. In the background, a large, stylized GE logo is visible, consisting of a circle with the letters 'GE' inside. The entire scene is set against a dark background.

**DID YOU KNOW?** The Phosphor coating on the inside of a G-E MAZDA F Lamp is a very fine powder. However, it is ground just so fine and no finer, because countless tests by G-E Research men have shown that's the way to get best all around performance — maximum light output throughout life.

## G-E MAZDA LAMPS

# WITH G-E MAZDA F LAMPS!

*Step ahead with Fluorescent—the new “indoor daylight” people want. Read why G-E means “Easier to sell!”*



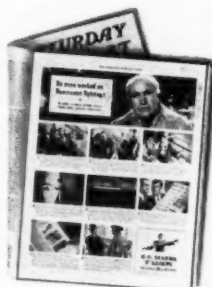
**1** When you sell fluorescent lighting with G-E MAZDA F lamps you are simply following public preference for products that carry the famous mark of G-E quality. Forty years of national advertising have made General Electric one of the best known names in the world—a name that means leadership in research.



**2** Following G-E's policy of giving the customer more and more light for his money, G-E MAZDA F lamps have been steadily improved (as much as 40%) and reduced in price (as much as 45%) since the first practical fluorescent lamp was introduced by General Electric early in 1938.



**3** G-E MAZDA F lamps carry all the prestige and the development background of MAZDA Research Laboratories. That means that the very latest improvements coming from MAZDA research are immediately available in the G-E MAZDA F lamps you sell.



**4** They are nationally advertised—over 90,000,000 ad impressions this year—in such leading magazines as the Saturday Evening Post, Collier's, Time, Newsweek and over 20 other business publications. That makes G-E MAZDA Fluorescent lamps easier to sell.



**5** Fixtures? No, G-E does not make fixtures for MAZDA F lamps, but cooperates with many fixture manufacturers. For best lighting service, we recommend fixtures certified by impartial Electrical Testing Laboratories of New York—either Fleur-O-Liers or RLM industrial fixtures. That permits the customer a wide choice of fixtures particularly suited to his needs.



**6** Fluorescent produces remarkable lighting results *when it is properly installed*. If you sell G-E MAZDA F lamps, you can draw on all of the engineering resources and knowledge of General Electric to assure the best possible job for your customer. G-E lamp engineers both at Nela Park and in the field will work with you toward that end.

G-E ADVERTISING IS TELLING YOUR CUSTOMERS the plain facts about fluorescent and how to be sure of getting a good installation. It urges them to:

- 1 Get competent advice—either from your local G-E distributor or the local electric service company.
- 2 Get certified fixtures for balanced performance—either Fleur-O-Liers or RLM fixtures.
- 3 Get a wide enough choice of fixtures to be sure of a fixture fitted to the job.
- 4 Get G-E MAZDA F lamps—all the advantages of MAZDA Research.

IF YOU ARE NOW SELLING G-E MAZDA LAMPS, are you using all of the above profit points to make your selling most effective?

IF YOU ARE NOT SELLING G-E MAZDA LAMPS, wouldn't you like to know more about the possibilities in fluorescent—with the backing of General Electric and MAZDA Research? See your nearest G-E Division office—MAZDA Research? See your nearest G-E Division office—or write General Electric, Dept. 166-EC-G, Nela Park, Cleveland, Ohio.

## GENERAL ELECTRIC

# Editorials

Earl Whitehorne, Editor

## The RC Wire Tangle

Failure of the NFPA Electrical Committee to take action at its June meeting to end the confusion over rubber covered wire requirements in the Code is disappointing. Apparently the electrical construction industry must wait until Dec. 1942 for any relief. That is too long.

There are two separate problems involved—the simplification of the building wire section of the code and the simplification of the wire line. Let's state the case plainly—

### 1. To Simplify the Code

The most important feature of the National Electrical Code is that it is national. This brings uniform wiring practice and standardized electrical materials and equipment. But a serious blow has been struck to its national acceptance.

In the 1940 Revision, new conditions were set up for the use of rubber covered wire. New tables now govern the carrying capacity of conductors. They affect the specification of wire, conduit, fuses and other details of a wiring system and they have proved too complicated.

In many cities where a new code automatically becomes the basis of the local ordinance, they are complaining that it is too confusing. Boston and Detroit have repudiated the 1940 rules and continue with the 1937 version. Other cities refuse to accept this new wire section and will not incorporate it in their local regulations. Electrical contractors say it is unworkable. Inspectors condemn it. Industrial plant electricians find it too complex. Foremen and workmen on the job throw up their hands. The national authority of the code is in jeopardy.

Apparently neither the contractors nor the inspectors on the Electrical

Committee understood what the effect of these new rules would be when they voted them in. Nor did the wire manufacturers themselves. It was all accepted as recommended by a qualified technical committee. But it has not worked. The wrong can be righted by the re-editing of this section to simplify the wire capacity and temperature tables.

What the simplified table should be is not to be stated on anyone's snap judgment. But the wire rules were simple before. They can be made understandable now.

The point is that the usefulness and authority of the code have been impaired. No red tape of procedure nor reluctance to admit a fault should be allowed to delay action. The tables should be restudied at once. Special action can and should be taken to simplify these wire rules and end the confusion quickly.

### 2. To Simplify the Line

The need to simplify the rubber covered wire line is even more urgent. The burden of excess and duplicating varieties of building wire is ridiculous. But in these war times it becomes imperative that we save this waste of copper and rubber now tied up in the warehouses of manufacturers, wholesalers, installers and users.

NECA recommended to the Electrical Committee the substitution of one new rubber insulated wire for the present family of rubber covered conductors. But the Electrical Committee has no power to act in this. It has to do with safety only.

Having approved all these rubber covered wires as safe, through the Underwriters Laboratories they may now approve another rc wire as a safe substitute for all of them, if such a wire is presented. But they can-

not withdraw the others unless these have proved unsafe in practice. The code can only add another wire to the line. It cannot act to reduce the line. It can speak only of safety.

There are two accepted procedures for simplifying a line of manufactured products. One is to request the Division of Simplified Practice of the Bureau of Standards of the U. S. Department of Commerce to call together all parties interested and work out a simplification program. This course was followed by NECA in moving for the elimination of all cable sizes over 500,000 circular mils. Many industries have taken similar action.

But there is danger in this going to the Government for help in running our affairs. There is danger of the Government taking over the Code someday and we do not want to hasten that day. For it will open the door to political influences that will seriously hamper the progress of the electrical industry.

The other procedure is to apply to the American Standards Association, maintained by the industries of America for just such work. One other course remains, however, and offers prompt action.

Let the wire manufacturers jointly study the possibilities for simplifying the rubber covered wire line. Then let them individually announce that, as a patriotic service, they are dropping the selected varieties from their standard lines at once to conserve stocks of copper and rubber. The government would approve such voluntary cooperation. The trade and public would applaud it.

### Need for Speed

There has been so much talk about the new code rules on rubber covered wire, that something should be done. Contractors want this settled in the interest of sound business. Inspectors are inclined to fall back on the fact that former practice was safe and ignore the present requirements. Automatically, respect for the Code is dulled. And this is bad.

The only way to cure this condition is to correct the cause. And that means both that the Code wire rules must be made workable and the number of wires must be reduced. It calls for prompt action by the Electrical Committee and by the wire manufacturers. And no previous action can justify neglect to straighten out the tangle.

## At Last a "Type S" Fuse

Action by the NFPA Electrical Committee has finally settled the long battle to select a "tamper resisting" fuse. The Bussmann patent had been offered for manufacture under license without royalty. It is now accepted and adopted as the industry standard and will be required in general use under the Code on Nov. 1st. This is good news.

Time is a great conciliator. The claims of competing manufacturers have kept the matter in controversy for years. Finally one model forged ahead in popularity. Now the patent owners waive their rights for the common good. The Electrical Committee has done well to act on it and have an end to the delay. The electrical industry should be grateful to the Bussmann Manufacturing Company for its generosity and also to the competing manufacturers who have stepped aside to permit agreement on this standard.

## War and the Small Contractor

Officially, we are not yet at war. But a war economy is already affecting the small contractors much in the same way that reports from the English electrical press report that it has affected contracting over there. As the pressure of defense production increases, the pattern of what has happened in Britain should be looked at by contractors here as a guide to what they may expect and prepare for.

In England, the *Electrical Review* says, the call is for more and still more electricians, particularly in the shipbuilding and ship repairing establishments. As a result men are being taken from ordinary contracting work to be drafted for the shipyards. Many small contractors have been ordered to wind up their businesses on a few days' notice and report to the shipyards where they are, taken on as electricians whether they have worked with the tools recently or not. They have had to abandon businesses built up over years with very slender chances of ever getting them going again, particularly when they are men of advancing years.

This demand for electricians is understandable after a visit to present day shipyards, where the rivet has

given way to the welder and ships are sewed together electrically with speed and strength. In many of our coastwise cities the condition spoken of in England is taking place. Contractors are closing up their own shops to go to work at high wages in defense projects and shipyards. Private business is slow and risky and materials increasingly harder to obtain.

In England it is suggested that the individualistic contractors form war-time companies to combine several shops, every partner taking shares to the value of his own business, thus keeping intact his capital instead of losing it. Wars have to be won by cooperation. Perhaps business can be saved by the same method during the war emergency.

## Power Tools for Home Wiring?

Existing price levels on residential wiring offer little incentive to profit conscious electrical contracting firms. Consequently, there has been practically no research in house wiring methods. While materials improve there is no parallel advance over early hand tool methods of installation.

The common use of power tools on commercial and industrial installations raises a question. Can electric drills, hand saws and screw drivers be used to advantage in residential wiring? Certainly the residential market is big enough to warrant some experimental effort.

The chances of cutting house wiring prices by power tools are remote. But there is a good chance that costs may be reduced and enough margin left to attract sales minded concerns into the field.

## Back Talk

### Lighting Values

**To the Editor**—"I have noted with interest the description outlining the lighting of a machine shop, the data for which is presented in a manner somewhat similar to that employed in the Illuminating Engineering Society's Data Sheets. This is both interesting and helpful to the industry. There is one point, however, which we of the Society have found important—that is, to qualify the statement of foot-candles as given under the heading 'Results'.

"To state foot-candles without so qualifying permits such a wide range of interpretation that the value of such a statement is greatly reduced. Foot-candles under incandescent lighting can be 'initial', that is, with the installation 'brand new' or 'in service' after the installation has settled down to a steady state. In incandescent lighting the depreciation, with reasonable maintenance, is usually 25 to 30 per cent, depending on the type of fixture and the nature of the interior. With fluorescent lighting the foot-candles can be measured with the installation 'brand new' or 'initial' (at the end of 100 hours of operation) or 'in service' after the installation has reached a steady state. We are finding that the difference between 'brand new' and 'in service' measurements may amount to as much as 40 per cent of the 'brand new' value.

"In our Lighting Data Sheets we state under which of these conditions the incandescent or fluorescent measurements were taken. In general, we avoid giving the foot-candles of the fluorescent installation 'brand new' and prefer to give either the 'initial' (at the end of 100 hours) or the 'in service' value. When the readings have been taken some time after the 'initial' period and enough time has not elapsed for the installation to reach a steady state, we give the number of months which have elapsed since the installation was made."

J. F. Parsons, Editor  
I. E. S. Data Sheets

*Your comment is welcome, Mr. Parsons, and we agree with you that these foot-candle values should be qualified. This is something which the industry has been overlooking and it will have to have attention. We will endeavor to have these foot-candles qualified in future wherever we can.*

### Atta Boy!

**To the Editor**—"Hearty congratulations on your editorial in June on the rewiring of houses. Everything you say is certainly true and maybe someday the industry will wake up, providing you keep pecking away. "Your point illustrates the need for more intensive organization of the electrical industry in local communities and this is a subject on which I expect to keep harping for sometime to come out here."

G. W. Weston, Manager  
The Electric Association  
of Kansas City

*Thanks Jerry and all it waits for is for the organized electrical industry to step out. Some strong league some day will sell a group of electrical contractors on the plan and they will set up a Rewiring Corporation to do mass production re-wiring with standardized materials and methods. Why not in Kansas City? The program will roll soon as some group shows the way.*

### Fixture Policy

**To the Editor**—"I will not wire a house for a customer and hang the fixtures unless they buy them from me—a radical departure, but it works just the same. Our builders know that we will not hang other fixtures. I will not hang commercial fixtures sold by jobbers direct to the customer, even though they offer us five per cent of the sale price. I have one competitor in Alexandria who has adopted the same policy. "The business belongs to us and we expect the jobber and the manufacturer to do their job and we are going to do ours. If every contractor would do this he could wire one-fifth the houses he now wires and make the same money, provided he sold electric ranges, refrigerators and water heaters."

J. Kent White  
Contracting Electrical Engineer,  
Alexandria, Va.

*It is a fine policy for any contractor, but it must be backed by good selling. Good selling will bring profits to any man's business. Congratulations to you Mr. White, and we hope you stick to it and sell many other contractors on the same idea.*

# WIRING

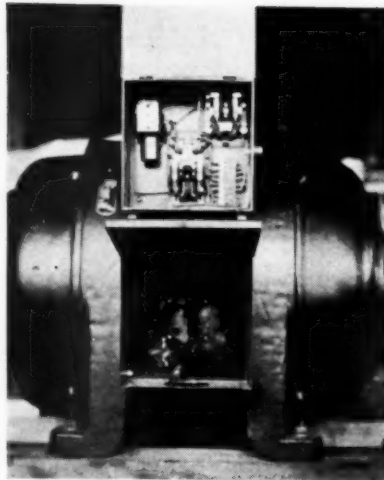
# Methods

## MOTOR-MOUNTED SYNCHRONIZING PANEL

Installation ease and economy are features of a compact, simplified synchronizing panel for synchronous motors, developed by F. W. Schultz of the Los Angeles branch of Fairbanks, Morse & Co.

Where synchronous motors replace squirrel cage induction motors, as is often done for power factor correction, it is only necessary to supply a synchronizing panel to be used with the existing induction motor starter. Standard practice is to mount the panel adjacent to the starter. However, in many cases this is impractical, especially where controls are group mounted. This new panel eliminates this objection because it can be mounted to the motor frame, directly above the motor terminal box.

The simplified panel has a compact design and special wiring diagram permitting it to be mounted in a standard terminal box of the type that is fur-



**COMPACT PANEL** for synchronous motors mounts on motor in standard terminal box. Field discharge resistor is mounted between the panel and motor terminal box. This equipment is on a 75 hp., 4-pole, type T Fairbanks-Morse motor.

nished with the F-M 1084 frame. A direct current ammeter is mounted on the side and an enclosed rheostat on the back of the panel to enable adjustment of the field excitation to the proper value. The field discharge resistor is mounted in a grille enclosure between the synchronizing panel and the motor terminal box.

The entire synchronizing unit is completely wired to the exciter and field of the synchronous motor so that it is only necessary to connect the three motor leads to the circuit and the unit is ready for operation.

## GROUNDING STREET LIGHTS

Individual grounds for each street light standard in the series lighting system for a housing project, were installed by the Beach Electric Co., Newark, N. J., the electrical contractors on the job.

Each ground connection consisted of a length of No. 6 bare copper wire,



**SPIRAL WOUND** bare copper wire, buried in along side the concrete base, serves as ground for this street light standard.

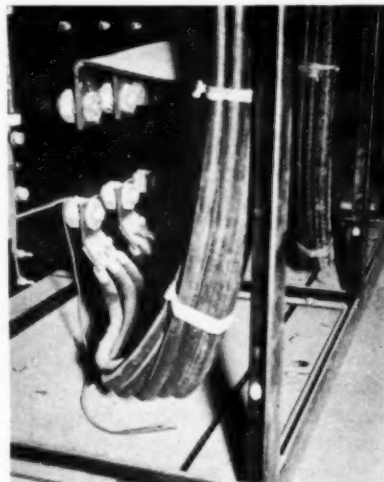
wound in a pancaked spiral and buried about 4 ft. in the ground alongside of the concrete base for the light standard. The ground wire enters the standard through one of the entrance elbows for the parkway cable.

## INTERLACED BUS

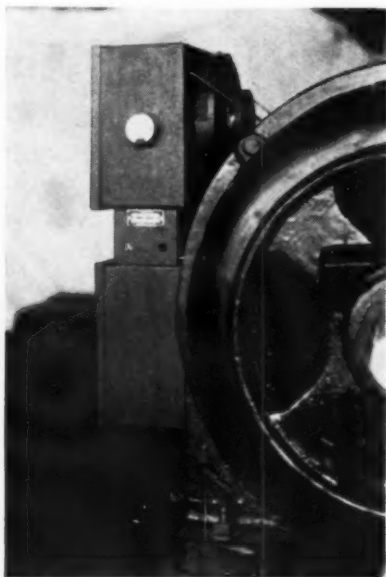
To cut down inductive reactance losses in feeders and service busses carrying heavy currents the spacing between conductors must be reduced to a minimum.

At the new Mellie Esperson building in Houston, Texas, the Alan Cooke Co., electrical contractors, used two effective methods to reduce conductor spacing as illustrated in the accompanying photos.

The main service conductors from the vault to the switchboard consisted of four 8 by 1/4-inch copper bus bars per leg. Instead of the usual arrangement with busses of equal potential grouped



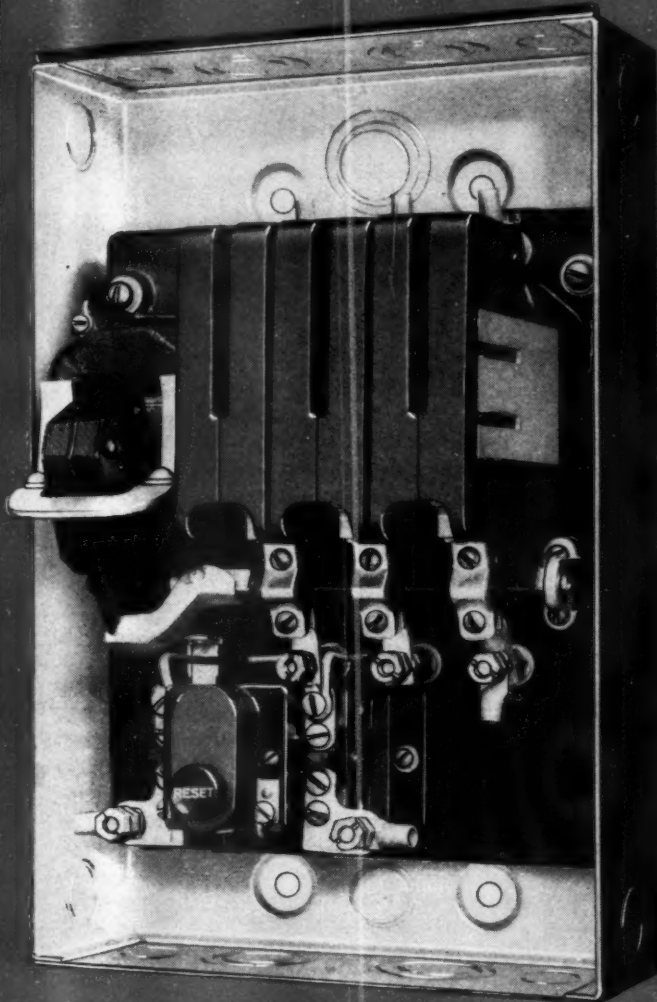
**PARALLEL CONDUCTORS** make up heavy power feeders, four conductors per phase.



**FIELD CONTROL** for excitation current is through the enclosed rheostat and direct current ammeter mounted on the back and side of the synchronizing panel enclosure.

# NEW!

## An Outstanding Improvement in A.C. Motor Control



### NEW! These Eight Important Cutler-Hammer Improvements

Bulletin 9586 Size 2 C-H Automatic Starter

- NEW** semi-enclosed arc shields with carbofrax inserts. Readily removable as individual units from front. No headroom needed. New blowout coil and arc shield design particularly effective in rupturing peak current arcs.
- NEW** larger magnet structure greatly increases life.
- NEW** No. 489 overload with pedestal mounting; arranged for easy removal from front of panel (C-H eutectic alloy type).
- NEW** high efficiency blowout coil design.
- NEW** heavier forged copper contacts with cadmium plating. Arranged for convenient inspection or replacement.
- NEW** electrical interlocks with double break silver contacts. Space and drilling for one extra interlock is provided on panel.
- NEW** moulded Thermoplas dead back panel arranged for 3 point support. Of particular interest to machinery manufacturers who purchase open panel starters.
- NEW** modern design enclosing case with lift-off cover. Light and roomy interior for easy installation.

## The Cutler-Hammer Size 2 Automatic Starter

(Handles up to 15 H.P. 220 Volts and 25 H.P. 440-550 Volts)

This new C-H size 2 across-the-line Automatic Starter is an important addition to the Cutler-Hammer line of A.C. Control. Its design embodies the very latest C-H electrical control principles and it is built specifically to handle more-than-average loads.

Its endurance on the job is no surprise when you stop to consider these major improvements: new, heavier, cadmium-plated, forged copper contacts; new larger and heavier duty magnet structure; new Thermoplas dead back panel; new high efficiency blow-out coil construction; and

improved eutectic alloy thermal overload protection. These modern features add up to real service, real dependability . . . to Cutler-Hammer world-famous dependability.

And yet, for C-H's superior performance and outstanding durability, you need pay no more. You'll find the cost of this new Starter surprisingly low. And you'll also find that it's just as economical to keep on the job as it is to buy. Write at once for further information. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wis. Associate Canadian Cutler-Hammer, Ltd., Toronto.



*Dust Safe VERTICAL Contacts*



# HERE THEY ARE!

## —The New Line of

# RACOLET

These Conduit Bodies, Standard and F. S. Types are the newest addition to the famous, nationally known Raco • All-Steel Line. Measuring up in every way to Raco • All-Steel's reputation for quality, the new Racolets embody the finest workmanship. The bodies are malleable iron, finely finished with a heavy coating of cadmium. Cover openings are surface ground . . . deep, clean-cut tapered threads. Hub edges are chamfered for easy introduction of conduits.

These new Racolets are modern and streamlined. There's plenty of room as there are no protruding screws or ears. Backs are semi-flat for rigid and uniformly flat mounting.

Available in threaded type for rigid conduit and threadless type for E.M.T. All the necessary covers are included in the line.

Explosion-proof fittings for hazardous locations, too, are found in this new line . . . including Line-Sealing fittings. And, of course, there are Vapor-Proof Fittings . . . both rigid and pendant types.

Write today for the new catalog, describing this new line. It's yours for the asking. Distributed Nationally by ALL-STEEL-EQUIP COMPANY, INC., 607 Griffith Avenue, Aurora, Ill.



**RACO • ALL-STEEL • PRODUCTS**  
Switch Boxes • Outlet Boxes • Cutout Boxes • Cabinets • Conduit Fittings  
Distributors in All Important Centers

WIRING  
*Methods*

[FROM PAGE 34]

together the bars are assembled alternately on insulating supports, each bar on a different phase from the adjoining bars. Connections to the switchboard terminals are tapped off each third bar. The center to center distance between



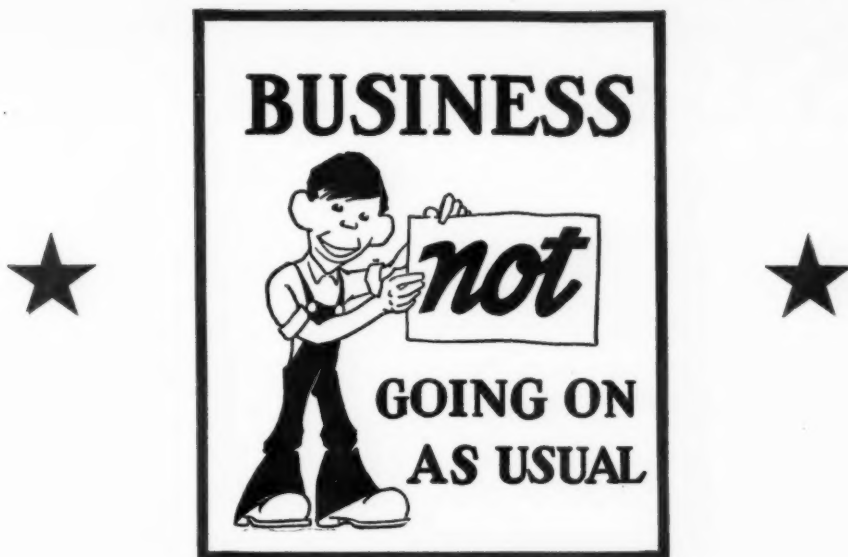
**ALTERNATE PHASES** on adjoining bars lowers effective electrical spacing in reducing reactance losses.

conductors for the entire bus load is the distance between any two bars.

For feeders to three large synchronous motors driving air conditioning machines, conductors were multiplied. Each leg of circuit consists of four 500,000 cm. wires. Inductive reactance losses are therefore lowered by the reduced interphase spacing.



**RECESSED FILES** keep blueprints, specifications and job records in order in the office of the Palisades Electric Co., Yonkers, N.Y. The 24 blueprint shelves are 37½-in. deep, 15-in. wide and 4-in. high. The file drawers are standard size. The book shelves above the files provide space for catalogs and books.



*The peace-time Law of Supply and Demand  
is in cold storage for the Duration.*

- ★ The imperative demand for National Defense material automatically hooks manufacturers onto the longest production line the country has ever known.
- ★ Our ability, as a manufacturer of electrical supplies, to obtain raw materials depends upon our proven value to National Defense.
- ★ We distribute through Wholesalers—which puts our T&B Distributors in a strategic position to know what percentage of manufactured materials goes to National Defense.
- ★ Today, T&B Distributors are handling Defense materials amounting to three-quarters of their total volume.
- ★ Despite the fact that the business of distributing electrical supplies is “not as usual”, here is evidence that T&B Distributors can adapt themselves to extraordinary conditions and function for National Defense with marked success.

## THE THOMAS AND BETTS CO., INC.

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N.J. • Sales and Service offices in 23 leading cities

*T & B Distributors cover United States and Canada*



RUBBER COVERED POWER CABLES • BUILDING WIRE

BARE WIRE • MAGNET WIRE • SERVICE ENTRANCE CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE

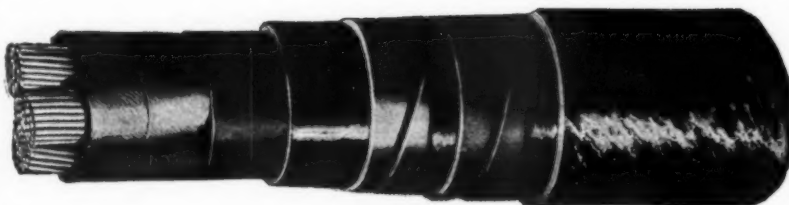
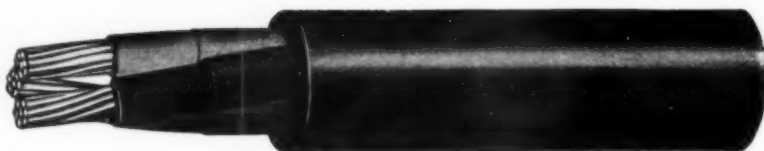
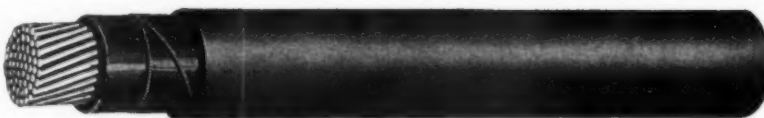
# CRESCENT

*Manufactures the*

## HIGHEST QUALITY

*Electrical Wires and Cables*

A FEW OF WHICH ARE ILLUSTRATED HERE



CRESCENT INSULATED WIRE & CABLE CO.

ASK YOUR WHOLESALE FOR



# CRESCENT

## WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

CRESCENT ENDURITE SUPER • AGING INSULATION

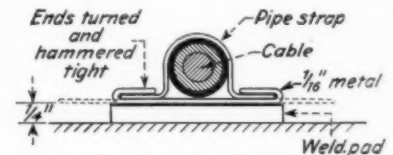


[FROM PAGE 36]

### CABLE SUPPORT

A method of supporting basket weave armored cables on ship construction, used by the Gulf Electric Co. of New Orleans, La. is also adaptable to hanging conduit on steel structures.

A 2½ by ¾-inch welding pad, ¼-inch thick has a strip of 1/16-inch metal



WELDING PAD and metal clamp hold pipe straps in ship cable installation

welded to the top with the ends overlapping ¾-inch. on either side. The pad is welded in place to the bulkhead to take the cable.

To fasten the cable, a pipe strap is set on the pad and the ends of the metal strip turned over and hammered tight to the strap lugs.

### JOB FILE

An unusually convenient adaptation of the job envelope method of cost control, used by the Hensley Electric Co. of Ft. Worth, Texas, substitutes filing drawers for the envelope or job folder.

Each current job is assigned to a drawer. Duplicate invoices, time cards and other records of job costs are filed under the job number and totaled monthly for job inventory and billing.

A portion of the cabinet is assigned to other records, jobbers invoices, inspection applications, social security forms, etc. The steel cabinets, shown in the accompanying illustration, are each 30-inches wide, 12-inches deep and 36-inches high set on 18-inch legs. There are 27 drawers in each section 3- by 9- by 12-inches in size.



JOB CONTROL records are carried in handy letter file "job envelopes" with a drawer assigned to each current job.

# Power where you need it

## WITH PYRANOL TRANSFORMERS

**NO VAULTS  
REQUIRED—SO  
YOU SAVE TIME •  
SPACE • MATERIALS**

### SAVE TIME

It's easy to install Pyranol transformers. Just set them down by the load (or on an overhead beam), run in light-weight primary feeders, and make connections.

### SAVE SPACE—MATERIALS

Putting the transformers close to the load saves on the cost of secondary feeders. And because Pyranol, the transformer cooling liquid, is noninflammable, out-of-the-way installations are easy to make—no fireproof vault is needed.

### SAVE ON OPERATION

Short feeders between transformers and load mean less drop in voltage, lower losses, higher efficiency. And since Pyranol is non-sludging and chemically stable, upkeep is practically negligible.

Figure out what these savings can mean in *your own plant*. You'll find, for speedy economical expansion of your power system, Pyranol transformers are a time- and money-saving answer.

### Other Aids to Overloaded Systems

#### AIR-COOLED TRANSFORMERS

Like Pyranol transformers, these units can be installed indoors close to the load to obtain greater capacity—plus savings in both time and materials. Particularly adapted to circuits 600 volts and below. Described in Bulletin GEA-897.



#### PYRANOL CAPACITORS



If power-factor is low, you can boost wiring capacity 10 to 40 per cent with Pyranol capacitors. They neutralize reactive (nonworking) current and make room for more load. Moreover, they may save enough in power costs to pay for themselves in one to three years. Described in Catalog GEA-77.

#### AIR-COOLED INDUCTION REGULATORS

Over-loaded circuits mean low voltage and inefficient operation of motors and lamps. G-E air-cooled induction voltage regulators will bring performance back to standard. And indoor installations are easy to make—no vault is required. Described in Bulletin GES-2285.



Call your G-E representative now for more information on load-center distribution. Ask for Bulletin GEA-2277. General Electric, Schenectady, N. Y.

**GENERAL  ELECTRIC**

402-34

# Motor Shops

## STATOR VISE

A small stator holder, designed on the principle of the chain vise, has been built for shop use by the Hagerstown Equipment Co., Inc., motor repair shop of Hagerstown, Maryland.

The vise is made of two wooden blocks and a leather belt with a tension device. The smaller of the two blocks is swivel mounted to a pipe



*SWIVEL VISE for holding small motor stators makes the rewinding operation easier in this Hagerstown motor shop. Tension device and buckle facilitate necessary adjustments.*

stand with a discarded motor end-bell for a base. The larger block has a V cut into it to accommodate the stator and is mounted to the first block by flat iron straps. There is sufficient space between the two blocks to allow the leather belt, which is attached to a tension device from an old swivel chair, to pass through. From this tension device the leather belt passes over a roller on the lower edge of the V block through a retaining strap at the top and over the stator to a buckle on the other side of the block. The belt is sufficiently long and has enough holes in it to accommodate several sizes of stators.

After the stator is slipped into the V block, the leather strap is buckled

and the tension knob turned until the stator is gripped firmly. The pedestal is low enough that the mechanic can sit down while working on the stator and the swivel arrangement allows him to turn the vise in any direction he wants.

## ARMATURE COVERS

When turning down the commutators of motor armatures, the Electric Motor Repair Company of Springfield, Mass., always covers the windings carefully with cloth and binds the ends with friction tape.

This is done to prevent copper chips from entering the windings. For, no matter how careful the mechanic may be, some chips may lodge between the coils and cause serious trouble later. It may take a little more time but it pays dividends in better workmanship and the elimination of callbacks with the resultant breakdown in customer confidence.

## BANDING WIRE HOLDER

To keep springy banding wire from unreeling all over the shop the San



*WIRE HOLDER for springy banding wire, holds the spool on a spindle and brakes the wire when closed.*

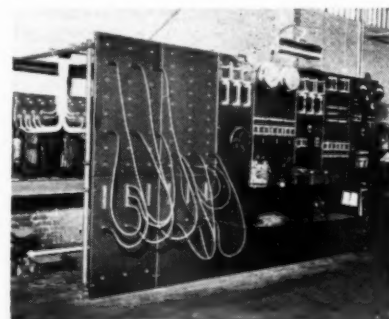
Antonio Armature Works in San Antonio, Texas uses heavy wood boxes to cage the erratic coils.

The boxes are made of 1-inch wood and open at the center. They are just large enough to hold the spool freely on a spindle. The spool is placed in the box with the end of the wire projecting. The weight of the lid acts as a brake on the wire as it is withdrawn. Edges through which the wire passes are reinforced with tough fiber.

## VARIABLE VOLTAGE TEST BOARD

The latest addition to the test board at the Electrical Installation Co., Cambridge, Mass., motor shop, is a two panel section composed entirely of plug jacks. These jacks are connected to the primary and secondary taps of transformers mounted at the rear of the board.

Panel No. 1, at the extreme left of the board, contains three vertical rows of test jacks which are phases A, B, C respectively of the secondaries of the transformers. Panel No. 2 also has three vertical rows of jacks which are phases A, B, and C respectively of the primaries of the transformers. The primary supply to the transformers is 550 volts, three phase. All transformer connections and percent-

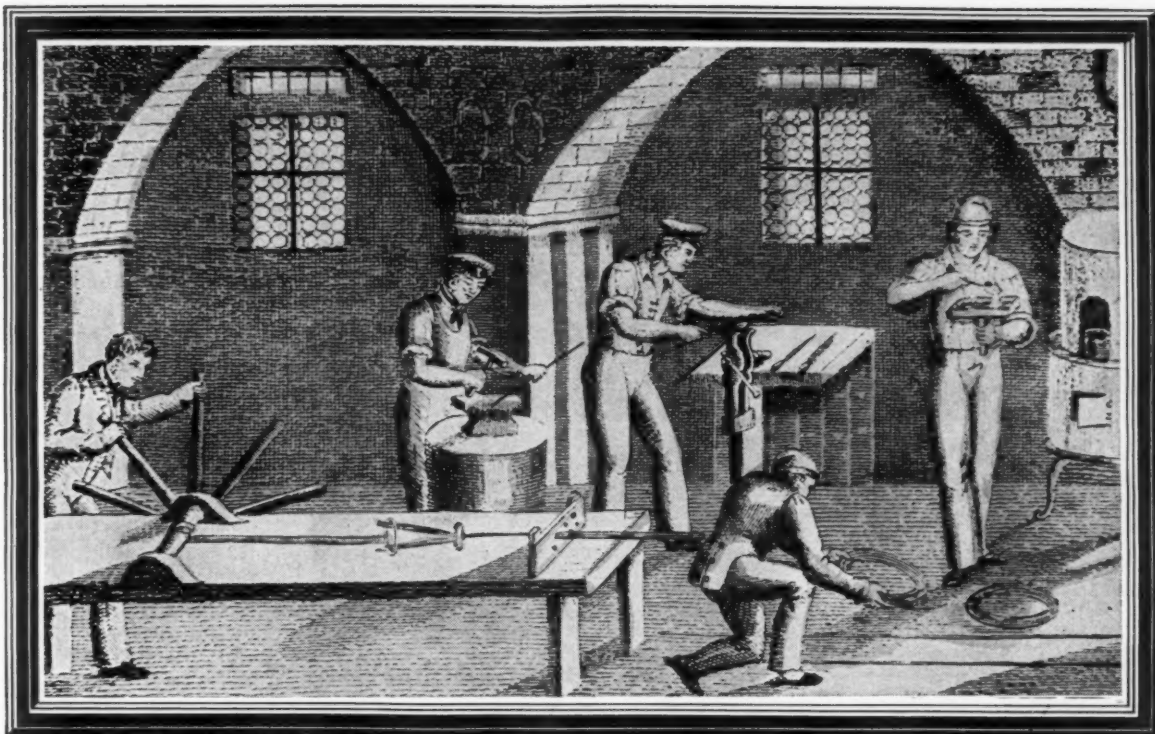


*TEST JACK PANELS provide a safe method of obtaining low and high tension voltage combinations for motor shop test purposes. Transfer panel adds flexibility to board.*

age taps are made by plug leads and the test jacks on the front of these panels. By using various combinations secondary voltages ranging from 29 volts to 4000 volts are available in 5 per cent steps.

The third panel contains a main disconnect switch and a hand wheel which, if turned to the right will give 50 per cent of the voltage available from the connections made on the jacks, and if turned to the left will give 100 per cent of this voltage. The fourth panel contains transfer switches

Engraved in 1828, this record of early wire manufacture would seem to indicate that straight-line production was even then in vogue.



BETTMANN ARCHIVES



**R**APID ADVANCES in the use of electricity for light, power and communications have greatly complicated the art of cable manufacture. Constant research in both cable design and production methods have, however, maintained General Cable Corporation in a preeminent position in the industry.



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**BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE**

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# MIDGET "MEGGER" INSULATION TESTER

500 VOLTS D. C.  
Simply by turning  
a crank



Range—0 to 50 MEGOHMS  
Weighs 3 lbs. Price \$80.

## Protection Against Electrical Breakdowns

Here is a testing device that should be used today by every maintenance man who is seriously interested in forestalling electrical failures. Detects dirt, moisture and deterioration in the insulation of practically all types of electrical equipment. No batteries or any "adjustments." Independent of all external current. Simply turn the crank; read the scale. Can be carried in pocket or tool kit and is ready for use *any time and any where.*



**"Meg" Insulation Tester**  
"Megger" instruments of this type have ranges up to 2000 megohms with hand generators up to 1000 volts.

Our Midget "Megger" Tester as well as other types of hand-driven and motor-driven "Megger" Insulation Testing Instruments is described in new Catalog 1685-EC just issued. Write for copy.

## James G. Biddle Co.

1211-13 ARCH STREET Electrical and Scientific Instruments PHILADELPHIA, PA.

*Motor Shops*

[FROM PAGE 40]

for the meters and plug jacks for instrument connections. The table top with compartments beneath are for use and daytime storage of the portable instruments.

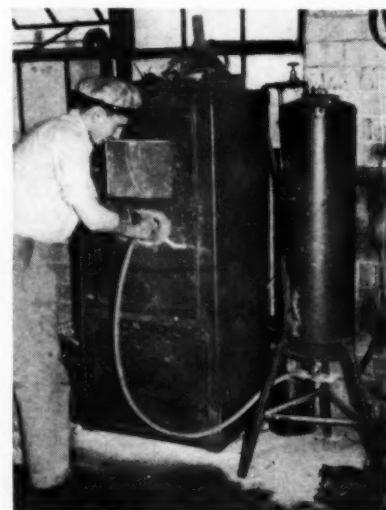
Panel No. 5 contains the motor-generator set control and the sixth panel contains switches connected to the double wound stator of the alternator, the upper switches being for the two-phase and the lower switches for the three-phase windings. The lower section of this panel contains transfer jacks providing connections to transformers, alternator or d.c. generator.

The last panel is the d.c. generator output panel, the lower section of which contains a 50 hp. d.c. rheostat. This rheostat can be used either as a light load for a d.c. generator test or as a starting rheostat for a d.c. motor test.

## STATOR CLEANING

A rig designed and built in the San Antonio Armature Works, San Antonio, Tex., for cleaning motor stators employs sand and compressed air.

The cleaning cabinet is an old refrigerator housing. An inside light and a window in the door permits the operator to watch his work. Hand holes below the window are protected with heavy rubber flaps and the operator wears rubber gloves. Air pressure is maintained at 50 pounds.



**SAND BLAST** cleaning booth made in a refrigerator shell. Hand ports cut in door are protected by rubber flaps.

*Electrical Contracting, July 1941*



## TELL IT TO THE JUDGE

AND THE ANSWER WILL BE

### SHAWMUT

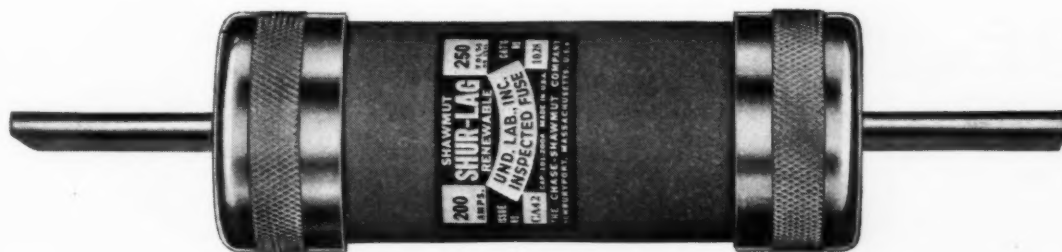
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## RENEWABLE FUSES

because they end production delays from inefficient fusing. The simplest, sturdiest, and most serviceable time-lag fuses made; the quickest and easiest to renew. The

most economical to use, the most efficient in operation and protection.

Shawmut is the word for fuses; it has been made so by a superiority in engineering skill and craftsmanship devoted exclusively to electrical protective devices for nearly half a century. Shawmut renewal links are also in a class by themselves; they are uniform in thickness throughout their length, give correct time-lag without the use of welded plates, are the handiest and fastest to remove or insert. Ask your dealer or write for our Bulletin 400.



## THE CHASE-SHAWMUT COMPANY NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

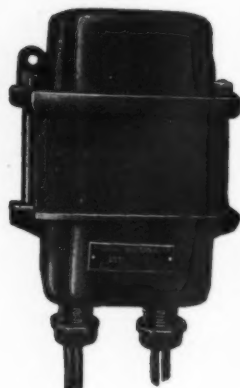


# FOUR POINT ECONOMY—



Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general-purpose transformer.



- 1**  
LOW INITIAL INVESTMENT
- 2**  
EASY TO INSTALL
- 3**  
MINIMUM MAINTENANCE
- 4**  
EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors\*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

\* Units rated 15 Kva. and larger for indoor service only.

## Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

## AMERICAN TRANSFORMER COMPANY

178 Emmet St.

Newark, N. J.

# AMERTRAN

Manufactured  
Since 1901  
at Newark, N. J.

# TRANSFORMERS

### PRODUCTS

American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

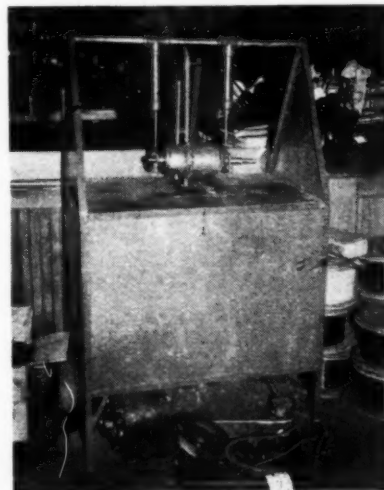
*Motor Shops*

[FROM PAGE 42]

## DYNAMIC BALANCE

For testing and correcting the dynamic balance of high speed rotors and armatures, the Fagan Electric Company at Little Rock, Ark., use a convenient balancing set driven by a one hp. motor.

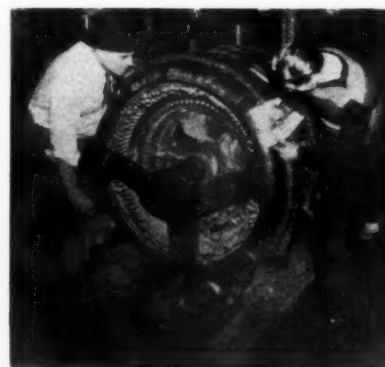
On a metal enclosed stand, a swinging support is hung between the apexes



BALANCE STAND uses swinging bearings and a high speed belt drive to test dynamic balance of rotor.

of two metal triangles. The support carries a pair of adjustable bearings which may be readily opened to take the armature under test.

A belt driven at high speed runs over a pulley above the stand. The supports allow the rotor to swing against the belt.



DOUBLE CHECK is made on this 200 hp. repair job by John Gorman, shop superintendent of the John R. Lange Electric Co., motor repair shop of Baltimore, Md. Gorman (left) is dictating data to Lee Shapiro, who makes a shop record of it. This is one of the larger motors handled by this company, others ranging in size from 1/200 hp. to 500 hp.

Electrical Contracting, July 1941

# Want Dependable Fluorescent Lighting Fixtures?

# *get* FLEUR-O-LIERS!



## How to be sure about FLUORESCENT LIGHTING

Specify FLEUR-O-LIER fixtures . . . *certified* by world-famous Electrical Testing Laboratories as meeting 50 rigid specifications set up by MAZDA lamp manufacturers to assure better light and better service.

**They're GUARANTEED!** Certified FLEUR-O-LIERS are guaranteed by their manufacturers to be free from any defects in materials, workmanship or assembly for 90 days.

**You get a WIDE VARIETY!** Choose from over 100 *different* industrial and commercial FLEUR-O-LIER designs—now available to help you get fluorescent lighting *fitted to your specific needs*.

**Get GOOD ADVICE.** Be sure your fluorescent lighting is properly installed. Your local lighting company will be glad to give you expert advice on how to get the most out of your investment in fluorescent.

*And when you buy fluorescent fixtures insist that they carry the FLEUR-O-LIER tag at the right.*

## Choose Certified Fleur-O-Liers

for  
Flicker Correction  
Durability and Safety  
Ease of Maintenance  
Efficient Lighting Performance  
Dependable Ballasts and Starters  
High Power Factor (85% or over)—  
and 44 other rigid specifications

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**Insist on it!**  
It identifies  
Tested, Certified,  
Guaranteed  
FLEUR-O-LIERS



## FLEUR-O-LIER *Manufacturers*

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

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Fleur-O-Lier Manufacturers • 2122 Keith Bldg., Cleveland, Ohio  
Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

*Utilize that  
narrow place-*

**AND SAVE VALUABLE FLOOR AND WALL SPACE!**

Where space is not available for a standard width panelboard, the

**FA TYPE AC CIRCUIT BREAKER  
COLUMN TYPE PANELBOARD**

is the answer. It may be placed between the flanges of an 8", 9" or 10" H column — between windows — or in any other narrow space. There it is up off the floor, out of the way.

Built of standardized units, the FA Column Type Panelboard affords automatic protection against sustained overload, and prevents interruption of service from momentary overload. In the case of a short circuit, or sustained overload, service is quickly restored (after the cause has been removed) simply by moving the handle to the ON position.

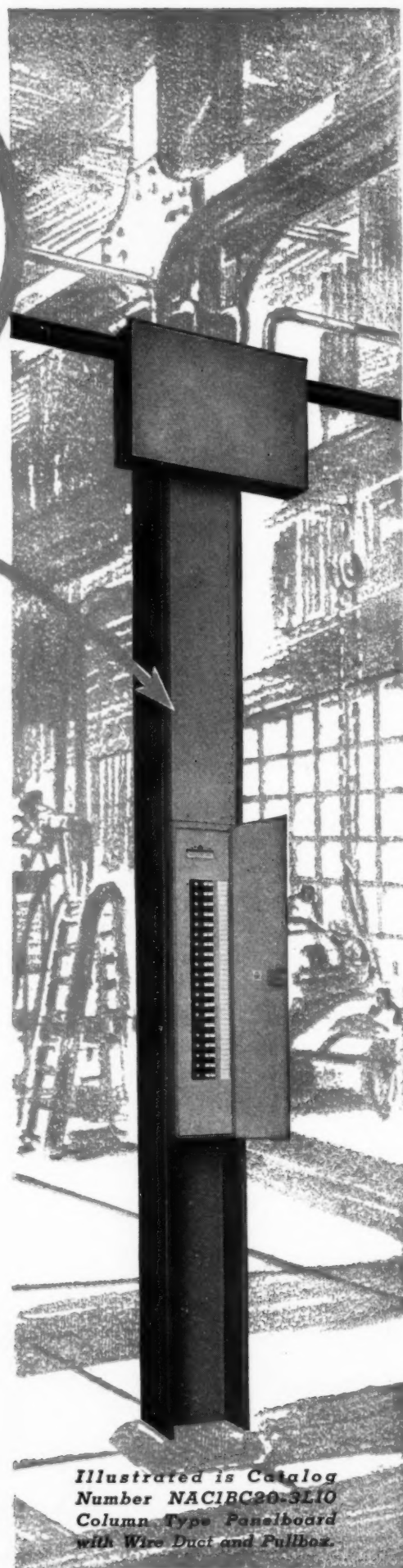
Furnished for either single-phase, 3-wire, 115/230 volt or 4-wire, 120/208 volt solid neutral service — with 4 to 40 single-pole branch circuits.

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with your light and power distribution problems. Their long experience is at your service — without obligation. Write for name and address of the one nearest you — and for Bulletin 62... Frank Adam Electric Company, St. Louis, Mo.



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*Illustrated is Catalog  
Number NAC1BC20-3L10  
Column Type Panelboard  
with Wire Duct and Pullbox.*

# Industrial Electrification and Maintenance

## ELECTRICAL FLEXIBILITY

**F**LEXIBILITY is a word frequently used in industry today. And it is generally considered with expansion, relocation, increased production. For it is a requisite of any of these adjustments in modern plants. And it is just as applicable to electrical systems and equipment as to the mechanical end.

What is the significance of electrical flexibility? Well, it simply means that the electrical system and equipment must be readily adjustable to changing conditions. To illustrate: — equipment should be adaptable to quick and easy relocation; feeders should have sufficient capacity to handle additional loads; circuits should be designed to permit frequent tap-offs and additions; lighting should be designed to permit efficient operation of the plant 24 hours a day. In short, the electrical system should be able to accommodate any reasonable changes that may occur.

That is what the plant electrical maintenance man faces today, with plants rapidly changing either entirely or partially from civilian to defense production. Rapid expansion, extensive changes, increased production — all demand electrical systems that can take it in their stride without a letdown.

The following pages discuss several available methods of increasing the flexibility of plant electrical systems. And the accompanying Maintenance Guide Sheet lists a number of check-questions designed to guide the plant electrical man in determining his plant's "electrical flexibility".

### Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service (this issue)

### Future articles will discuss—

13. Extending Automatic Control
- Additional subjects will be announced next month.

## INCREASING FLEXIBILITY OF ELECTRICAL SERVICE

**W**ITH companies making lipstick holders one day and rifle shells the next, or typewriters in one part of the plant and machine-gun mountings in another, the problem of *increasing flexibility* is high up on the electrical maintenance man's "must do" list.

Of course, the main factors that contribute to flexibility are automatically taken care of in the ideal plant electrical system. They have been considered by every electrical man at one time or another. Most of them have been discussed separately in previous issues of *Electrical Contracting's* "Industrial Electrification and Maintenance" sections. However, none of us ever achieves the ideal, and so it will be worth while to review them here.

*What is Meant by "Flexibility"?* The dictionary says flexibility means "readily adjustable to meet the requirements of changing conditions." If we carry that definition into plant operation, we can see right away that there are at least three kinds of changing conditions that the electrical maintenance man must stand ready to meet:

*First*, with the government tossing off orders for millions of dollars of equipment and products every day, he obviously has to be *ready for expansion*.

*Second*, with plants having to make rapid readjustments in layout and equipment used to take care of unusual manufacturing problems, he must stand ready to *move equipment in a hurry*.

*Third*, with equipment shortages and priorities making it impossible to get quick deliveries on new equipment—if, indeed, the equipment is available at all—he must get the most out of existing equipment.

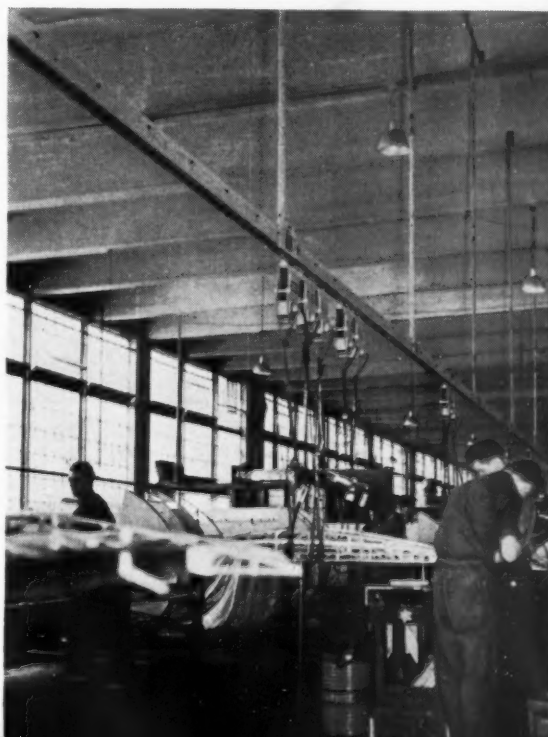
Let's take a look at these three kinds of flexibility, to see what they involve electrically:

### 1. Ready for Expansion

Probably the electrical maintenance man's biggest bottleneck is his distribution system. As departments are added, or more machines are crowded into existing space, the plant wiring will undoubtedly be loaded to capacity or more. If a plant *starts out* with inadequate wiring, it will be practically impossible to stand the strain without serious breakdowns or interruptions.

A good first thing to do, then, will

**TOOLS MOVE** to the work by trolley at Piper Aircraft Corp., Lock Haven, Pa. Portable electric drilling tools, suspended from this 150-ft. Trol-E-Duct system, cut waste movement of work-in process.



be to make a quick load survey, not only to see where the heaviest load is concentrated at present, but also to determine if possible where the greatest electrical demands are going to be made in the near future.

Such a preliminary survey will turn up cases of drive and other load conditions that should be corrected right away. There will be places where drives are antiquated and inefficient, controls and protection are poor, power consumption is high in relation to production, records show recent high-cost maintenance labor and materials.

A systematic check on the adequacy of the electrical distribution is then in order. It should determine whether conductors are of sufficient capacity, and whether voltage conditions would not be improved by a re-examination of load centers to determine whether new transformer stations should be installed to cut down the length of secondary circuits.

Voltage drops in excess of two per cent should be corrected, if possible. It might be a good idea, also, before the real rush sets in, to increase cable sizes in important circuits beyond current requirements.

Poor power factor may also be cutting down the effectiveness of the plant distribution system. Under such conditions more current is needed to supply the power required, and hence the I<sup>2</sup>R drop in the lines is more than it need be.

Standard methods for measuring power factor are given in manuals and texts and require a fair amount of calculation. However, for practical purposes, the voltmeter-ammeter-wattmeter method should suffice, even though its results are strictly accurate

only for balanced circuits. The following formulas can be used:

$$\text{Single phase: P. F.} = \frac{\text{KW}}{\text{E.I.} \times 1,000}$$

Two phase, three-wire:

$$\text{P. F.} = \frac{\text{KW}}{\text{E. I.} \times \sqrt{2} \times 1,000}$$

Three phase:

$$\text{P. F.} = \frac{\text{KW}}{\text{E. I.} \times \sqrt{3} \times 1,000}$$

The chief cause of low power factor in an industrial plant is the underloading of induction motors. Where possible, induction motors should be loaded to their full capacity or higher. Almost any short air-gap induction motor of 50 hp. and over, at 1,500 rpm. or over under normal load, will operate around 90 per cent power factor. When loaded 25 per cent above normal rating, it may operate as high as 93 per cent.

Underloaded transformers are another source of low power factor. They should be replaced with smaller sizes.

In addition to running induction motors at full rating or slightly higher, power factor may be corrected by using capacitors at individual motors or in banks, or by using synchronous motors or synchronous-induction motors. Capacitors will often prove to be the simplest and most inexpensive solution, since they require no attention, take up little room, and their own losses are small.

Determination of the size of the capacitor required to raise power factor to a desired figure involves the calculation of the wattless component of the power under existing power factor, and the wattless component under the power

factor desired. The difference of these two figures gives the rating of the capacitor needed. The maintenance man would, of course, get assistance in these calculations from the supplier of the equipment.

Another factor contributing to the overloading of the plant distribution system may be the disadvantageous scheduling of equipment use. With more and more plants going into multiple-shift operation, the opportunities are increasing for the better allocation of certain peak loads—heat-treating furnaces, for example. In this way, too, the plant's maximum-demand charge may be lowered.

In connection with power-factor correction and scheduling machine use, it might be well to look at group drives, too. The operation of a single machine on a long shafting may require starting up a large motor, and running it at reduced loading.

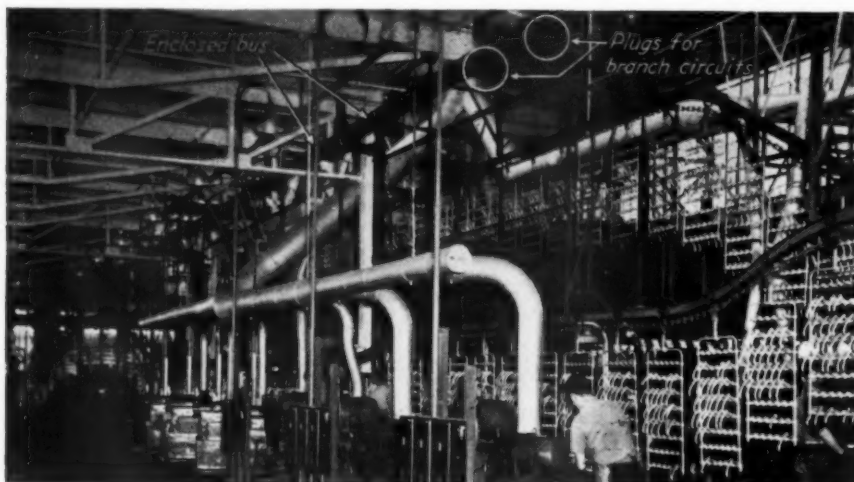
Before leaving this question of getting ready for expansion, it will be well to put in the reminder that *preventive maintenance* is more necessary than ever before. This requires a re-examination of periodical inspection procedures. Above all, review what shall be considered "adequate" in spare motors and electrical supplies.

## 2. Moving Equipment in a Hurry

With speed more and more a factor in production, the popular electrical man will be the fellow who can "do the impossible" in changing plant equipment around on a moment's notice. The best procedure, of course, is to anticipate such changes by having power available wherever it might conceivably be needed.

Modern enclosed bus bar feeder distribution equipment is available which will greatly simplify this problem. This consists of standard unit length and shapes of metallic housing inclosing bus bars suitably supported, both electrically and mechanically. Such equipment has Underwriters' approval for a-c or d-c systems up to 600 volts. It makes large currents available at low losses and at locations remote from the service entrance.

In connection with the cost of flexible operations, the salvability of this type of equipment is important. Because of its unit construction, either the whole or part of a system may be removed and readily reinstalled in another location to meet changing load or production requirements. For requirements where size, number, and location of motors are indeterminate, special types of busway equipment are available, in which plug-ins at any convenient points can be made with special plugs con-



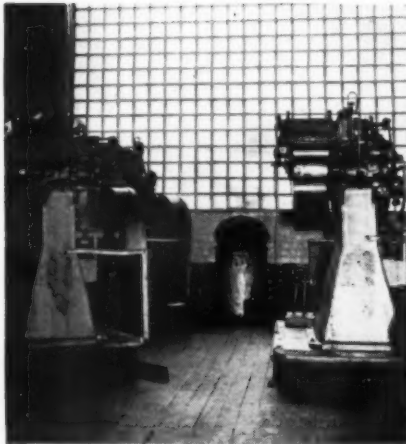
**ANY WHERE**—This General Motors, Ternstedt Trenton Division plant is notable for its flexible power distribution. From the utility's 4,150 volt incoming line, power is stepped down at six sub-stations to 440 volts for power service and 120/240 volts for lighting. Power for production is distributed throughout the plant by enclosed buses. Individual machines no matter where located in the area may be plugged in at any spot.

# MAINTENANCE GUIDE SHEET

## 24 CHECK POINTS ON FLEXIBLE ELECTRICAL SERVICE

Why not check up your plant for opportunities to increase the Flexibility of Electrical Service? Keep these 24 points in front of you.

Check Points	Comments
1. Does power company service installation insure continuity of operation? .....	.....
2. Is there room for expansion of main panel board installation? .....	.....
3. Is conductor capacity adequate? (Are any voltage drops to point of use more than two percent?) .....	.....
4. Do main circuits provide sufficient operating flexibility? .....	.....
5. Are there sufficient power outlets for quick changes in equipment layouts? .....	.....
6. Have load centers shifted? .....	.....
7. Where are the greatest demands for additional loads likely to occur? .....	.....
8. Can load be more evenly allocated over a 24-hour period? .....	.....
9. Do changed load conditions make it advisable to re-examine adjustments on protective relays? .....	.....
10. Would better scheduling reduce demands on over-taxed lines? .....	.....
11. Can idle machine time be reduced by changes in controls? .....	.....
12. Would some sort of signalling system or automatic cut-out arrangement reduce maximum demand? .....	.....
13. Are under-loaded induction motors or transformers producing a poor power factor condition? .....	.....
14. Where under-loading or intermittent full-loading of induction motors cannot be avoided, should capacitor units be considered to correct power factor? .....	.....
15. Would change-over from group to individual drive add to flexibility of machine operation? (Would it avoid large starting currents on over-taxed feeders?) .....	.....
16. Would quick-reset circuit breakers in place of fuses cut down lengths of outages on momentary overloads? .....	.....
17. Is plant illumination sufficient for efficient multiple shift operation? .....	.....
18. Is plant illumination sufficient for efficient operation, no matter where layout changes place equipment? .....	.....
19. Are spare units sufficient to prevent delays on quick demands for replacements or expansion? .....	.....
20. Would integrally mounted motors make it possible to put more machines on wheels, enabling equipment to be moved to the work rather than vice versa? .....	.....
21. Would fan units or small heating units make extra factory space available? .....	.....
22. Would simplification of control add to the flexibility of machine use? .....	.....
23. Will possible increased use of portable tools and other small equipment require special "trolley" or power transmission? (Or at least greatly increased outlets) .....	.....
24. Is recently installed equipment that "overlaps" into adjacent departments creating unconsidered hazards invalidating fire insurance contracts? .....	.....



**MACHINES MOVE**—At Peerless Tube Company coating machines and lithographing presses were put on lift platform skids making it possible to change the entire machine set-up away from the conveyor production line and then move the machine alongside of the line when ready. Two machines left are in operation—right is being set up.

taining overcurrent protective devices.

Today's manufacturing operations often call for portable tools and machinery that can follow the work in progress. For such applications, trolley-type busway units have been developed, by means of which the electrical connection can easily follow the line of production.

Of course, such elaboration is not always possible or necessary. But the least the electrical maintenance man can do is to see that there are sufficient convenience outlets in various parts of the manufacturing area. So when hurry-up or temporary changes are called for, he can get the power to the job with a minimum of trouble and delay.

He can also cooperate with the company industrial engineer in the matter of making more equipment self-contained electrically—with motors and controls mounted directly on it. Then everything can be moved as a single unit. Many plant men are putting a lot of equipment on wheels or casters, making moving that much simpler. Small auxiliary equipment mounted for ready portability in this way may save hundreds of feet of travel by the work-in-process, facilitating straight-line production by moving equipment to the work, instead of routing products or parts away from the normal line of operations in order to take them to functionalized departments.

And here is the place to put in a word about lighting: A plant may be all set as far as ease of moving equipment about is concerned—but woefully unprepared with respect to working conditions *after* the move. This may be a good time, then, to consider whether

general, overhead illumination is such as to provide good seeing conditions no matter where equipment is stationed.

If overhead illumination is not adequate in all places where productive operations conceivably might be carried on, a choice can be made as to whether it would be advisable to increase it, or to provide outlets and extensions for the quick installation of localized lighting wherever it might be required.

The same considerations, of course, apply to temperature, atmospheric, and safety conditions. It might be well to have a few extra fans on hand, to think about the extension of fume-exhaust ducts, and, perhaps, to consider small electric heating units. Often in the scramble to make use of every available bit of manufacturing area, points in the plant are used that cannot be serviced adequately by the heating or ventilating system.

The matter of safety cannot be over-emphasized in this connection. In moving equipment or making temporary installations for emergency manufacturing problems, many companies are unwittingly creating hazards and invalidating their insurance contracts. Where spray booths are extended, or other equipment containing hazardous features is contemplated, it is well to double check upon all operations *currently going on* in the location under consideration.

### 3. Getting the Most Out of Existing Equipment

If a plant suddenly has to get a lot of additional production out of existing equipment, there are really only four major opportunities open to it:

- (1) It can operate machinery with *fewer interruptions*.
- (2) It can put heavier loads on machines, or use machines on work for which they were not specifically designed, by equipping them for *unaccustomed loads*.
- (3) It can step up output by *speedier operation* of machines.
- (4) It can get *longer use* out of existing equipment by means of multiple shifts or better scheduling.

Let us see what these things mean to the electrical man:

1. For fewer interruptions, a re-examination of machine and circuit protection is certainly in order. On many lines protected by fuses, it might be well to consider quick-reset circuit breakers, so that no long delays are incurred on momentary overloads.

It will also be well to look again at the adjustments on protective relays,

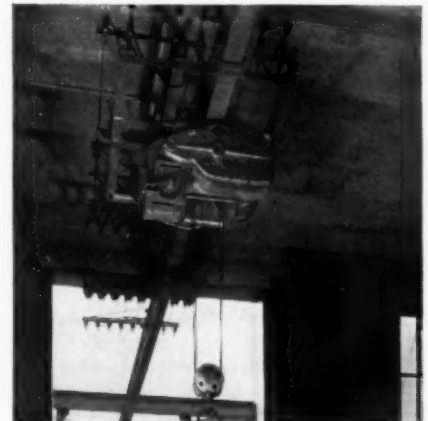
not only with a view to "ordinary" interruptions, but also to get ready for unaccustomed loads. Limits of satisfactory operation are bound to be different. Greater use of simplified push-button control will also help if machines are to be run by inexperienced operators.

2. Heavier or unusual loads also call for a look at the types of motors on important drives. From nameplate information, the characteristics of the motors can be looked up, and checked against torque and starting requirements to be called for by changes in the loads to be put through.

3. Speedier operation can usually be accomplished by changes in the mode of power transmission—although, of course, since horsepower output is a function of speed, a weather eye will have to be kept out against overloads.

4. Longer use of equipment usually means multiple-shift operation. The points already made about illumination, in connection with moving equipment, apply with double force here. For the sake of safety and efficiency, the seeing conditions on the "graveyard shift" should, as much as possible, be made as good as those on the day shift.

But it is important to remember that longer use of equipment can also be achieved by *less idle machine time* in the ordinary operation cycle. This is usually the problem of the methods department, which must draw up "man and machine charts" to study the effectiveness of the operation cycle. But the electrical man's cooperation will definitely be needed. Many plants have made important time savings by a few simple automatic controls which permitted equipment to keep operating, while the machine tender used his hands for grasping new work or disposing of ejected work.



**NEAT TRICK** in handling—this ceiling runway for electric hoisting at the Orville Simpson Company, Cincinnati, passes through the doorway. A break in the seven conductors makes cutaway at doors a minimum. Trolleys on car bridge the gap.

## Related Design . . . A Feature of Clark Control One Finger Mechanism Fits an Entire Line of Devices



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**Permanent Grip**—In every Gorilla Grip Contactor the principles of nut and wedge are used for a maximum compression, dependable locking action in every conductor.

**Perfect Contact**—Pressure is uniformly distributed over full contact area of the conductor.

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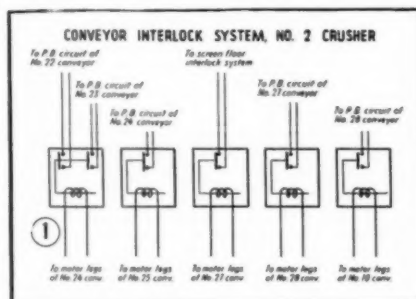


**National Electric  
PRODUCTS CORPORATION**  
1000 FULTON BUILDING, PITTSBURGH, PA.

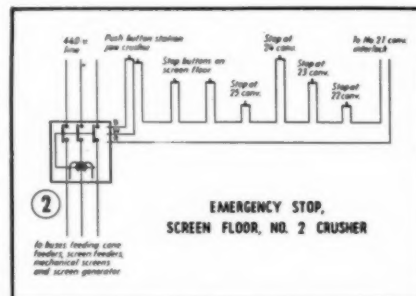
## Conveyor Control Saves \$20,000

Clogging of a hopper or stoppage of a head conveyor in one of the crushing plants of the Climax Molybdenum Company, Climax, Colo., used to be a serious business. Before the operator could shut down conveyors that were still feeding, there would be a spill of large proportions, and a costly jam-up.

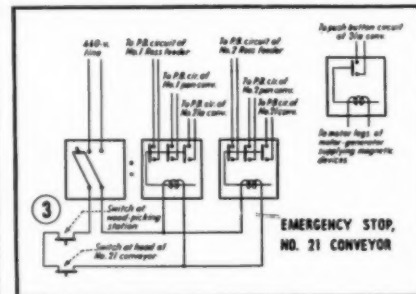
Complete interlocking of the driving motors on the belt conveyors and auxiliary equipment now makes the entire handling system automatic. This prevents incorrect starts at all times, and shutting down feeder conveyors in emergencies. The principle is simple—



1—SCHEMATIC DIAGRAM of the interlocking motor controls. The drive on conveyor 28 won't operate unless the drive on conveyor 10 is working; 27 won't operate unless 28 is going; and equipment operated by buttons on the screen floor, interlock system, won't function if drive on conveyor 27 is shut down.

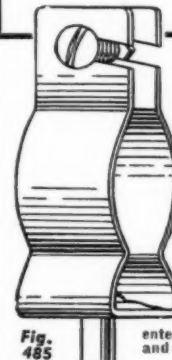


2—INTERLOCK from motor on conveyor 27 is in series with this feeder equipment. If 27 is out, this equipment won't operate.



3—EMERGENCY STOPS if switch at wood picking station or at head of conveyor 21 is opened, the pushbutton circuits of the auxiliary feeder equipment is opened as well as pushbutton circuit of conveyor 21.

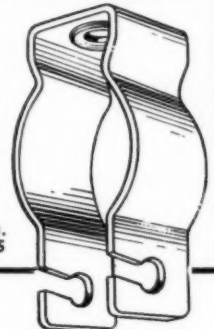
## AVOID Costly Remounting Use PAINE HANGING DEVICES



### IN SOLID MATERIALS IMPROVED CABLE CLAMP

A firm, rustproof, cable support with a gimlet pointed screw for use on cross arms or poles—also in solid material such as brick, concrete and stone used with PAINE Malleable Shield. Patented "snug-fit" bolt slot saves time and labor.

### IMPROVED CONDUIT CLAMP



Speeds up mounting of conduit on wood, brick, stone, concrete and other materials. Patented "snug-fit" bolt slot shortens installation time and improves the job.



### MALLEABLE LAG SCREW SHIELD

Provides positive threads for square or flattened head lag screws in solid material. Expands under screw pressure and gives secure anchorage. Will not strip or freeze screw.

### MACHINE BOLT SHIELD

Single or Double Type

A strong dependable anchor that gives strong bearing at all points when expanded in solid material. Interlocking construction makes it practically one piece. For all standard Machine Bolts.

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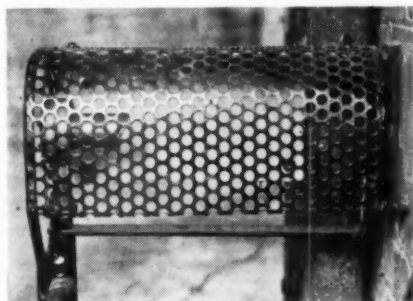
taps from two legs of one motor are hooked to the holding coils of a magnetic contactor, and this contactor is connected in series with the stop wire of the pushbutton control of a second conveyor motor. Thus, the second motor cannot operate unless the first motor is running. If further sequence is desired the second motor can similarly be connected to control the pushbutton circuit of one or more additional motors.

The belt conveyors now handle 700 tons of crushed ore per hour with never a jam-up. Completely interlocked motor circuits do the trick. Annual savings through this sequence control are estimated at more than \$20,000. This is based on the cost of cleaning up spills, repairing or replacing damaged conveyor belts, and loss of production on stoppage, incurred before the interlocking was installed.

### Oil Burner Watched by "Electric Eye"

By maintaining a continuous "watch" on the flame of an industrial oil furnace, an "electric eye" provides immediate protection in case the flame is extinguished. If light from the flame fails to reach the photocell, a relay controlled by the cell actuates a solenoid-operated valve and instantly shuts off the oil supply.

The furnace itself is of special design for melting metal in a chemical manu-



*WHEN THE FLAME goes out this electric eye cell shuts off the oil supply.*

facturing process. Because it operates continuously, an automatic pilot was not required. Moreover, at the high temperature at which the furnace operates, a thermostatically controlled valve for instantaneous shut-off was impractical except at excessive cost.

As shown in the photograph, a perforated metal guard protects the unit from accidental external interruption of the light of the flame. The light sensitive cell is mounted about a foot back from an opening in the furnace wall, in view of the oil flame, the relay panel and solenoid.

Under normal operating conditions,



Produce more this year by using faster tools



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PIPE WRENCH

Housing guaranteed not to break down when you need it—no expense or time lost for repairs

Millions of **RIDGID** Wrenches are doing their share to speed vital work this year . . . However tough the job you give the **RIDGID**, that guaranteed housing can take it — no time out, you need fewer spares. Safe chrome molybdenum jaws grip and let go instantly, are easily replaceable. Handy pipe scale on hookjaw, adjusting nut in open housing spins quickly to pipe or conduit size. Comfort-grip alloy I-beam handle and efficient balance of whole tool means less fatigue. Get more work done, with less tool expense — ask your Supply House for **RIDGID** Wrenches.



No More Housing Repair Expense

If this housing ever breaks or distorts we will replace it free.

Made in sizes 6" to 60"  
End pattern 6" to 36" for pipes in coils

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**RIDGID**

WORK-SAVING PIPE TOOLS

# 3 exclusive

**1**

"INCH-MARKING"



**3**

ELECTRUNITE BENDER

**2**

BENDING  
INSTRUCTION  
TAG

**ACCURATE STUBS**

TO MAKE 1" STUB BEND WITH 1" ELECTRUNITE BENDER, ALLOW 2" FOR TAKEUP AT BEND.

WITH 1" ELECTRUNITE BENDER, 1" STUB BEND WILL BE MADE.

TO STRAIGHTEN

PLACE BEND OF BEND OVER STUB AND PUSH BEND TO FLAT IN ONE FULL STROKE.

**TO MAKE A SADDLE BEND**

STEP NO. 1

PLACE TUBE IN BENDER SO THAT 1" ON TUBE IS AT 1" ON BENDER AND MAKE 45° BEND.

STEP NO. 2

REVERSE TUBE IN BENDER AND PLACE 1" ON TUBE AT 1" ON BENDER AND MAKE 45° BEND.

FINISHED SADDLE-BEND THAT FOLLOWS BEND 1" ON BENDER (SEE TAG).

STEP NO. 3

**PERFECT BACK TO BACK BENDS**

MAKE TUBE BEND AT 1" BENDER OR BENDER 1" BEND 1" FROM 1" ON TUBE AND MAKE 45° BEND.

STEP NO. 1

PLACE TUBE IN BENDER SO THAT 1" ON TUBE IS AT 1" ON BENDER AND MAKE 45° BEND.

STEP NO. 2

REVERSE TUBE IN BENDER AND PLACE 1" ON TUBE AT 1" ON BENDER AND MAKE 45° BEND.

FINISHED BACK TO BACK BENDS THAT FOLLOWS BEND 1" ON BENDER (SEE TAG).

STEP NO. 3

**TRUE OFFSETS**

MAKE BEND AT 1" ON TUBE. MAKE TUBE IN BENDER AND BEND TO TRUE OFFSET 1" ON BENDER AND BEND TO TRUE OFFSET 1" ON TUBE. MAKE BEND AT 1" ON TUBE AND BEND TO TRUE OFFSET 1" ON BENDER. MAKE BEND AT 1" ON TUBE AND BEND TO TRUE OFFSET 1" ON BENDER. MAKE BEND AT 1" ON TUBE AND BEND TO TRUE OFFSET 1" ON BENDER.

## Bending Instructions

ELECTRUNITE STEEL TUBES



### THE "INCH-MARKED" TUBE

1. All measurements are computed on the use of ELECTRUNITE bending Tool S-1472-1473 and 1474.
  2. When bending on floor keep one foot on bender.
  3. Use mark "B" as base for all measurements.
  4. To complete accurate 45° bend, start with tube flat on floor and bring bender handle to vertical position.
  5. On concrete slabs remove bender head. Place bender head on tube close to slab. Pull tube over bender by hand.
  6. For best cutting results use 32-tooth hacksaw.
  7. For shorter radius bends use ELECTRUNITE hickey, catalog No. 2195-1/2", 2196-1/4" and 2197-1/2".
- BENDING SPRINGS now available for 1/2" and 3/4" size. These springs fit inside tubing and simplify short radius bends with Hickey type benders; simply moving slide into line with wandering partitions. After tube is bent, hold of the spring or slight backing up of bend releases spring.
- For bends on 1" and larger:
1. Both 45° and 90° factory-made elbows are available in 1" and larger.
  2. Hickeys are available for large sizes. If tubing is marked thru Hickey, 10" at a time, any bend can be made.
  3. It pays to invest in one of our Hickey type mechanical benders. If you have 100 bends or more, this tool pays for itself due to savings in cost of elbows and fittings.

Steel and Tubes Division  
REPUBLIC STEEL CORPORATION  
CLEVELAND, OHIO

2-48 ELECTRICAL METALLIC TUBING

ELECTRUNITE

THE ELECTRICAL RACEWAY WITH A CONTINUOUS

1 6-FOOT 2 3 4 5 MADE IN U.S.A. 6 8

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**"INCH-MARKED"**

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## ELECTRUNITE Steeltubes

U.S. PAT. OFF.



When you use "Inch-Marked" ELECTRUNITE STEELTUBES, you have as working advantages—money-saving

advantages—three exclusive features offered by no other electrical raceway.

(1) **"INCH-MARKING."** This newest development in electrical raceways was applied to ELECTRUNITE STEELTUBES to make it easier and more accurate to use—more economical to use. It consists of inch and foot marks clearly and *accurately* printed along the entire length of each piece of tubing. Thus, the mark for cutting or bending already is made for you.

(2) **BENDING INSTRUCTION TAG.** An ample supply of these tags is supplied with each shipment of "Inch-Marked" ELECTRUNITE STEELTUBES. On one side are detailed instructions and on the other side simple diagrams for making various types of bends.

(3) **ELECTRUNITE BENDER.** This handy tool was designed for use with "Inch-Marked" ELECTRUNITE STEELTUBES—to provide the ideal combination for making exact, predetermined bends simply and with little

effort. The bender is a one-piece casting with built-in instructions which cannot be lost. With it, bends can be made with greater accuracy and ease than ever before possible.

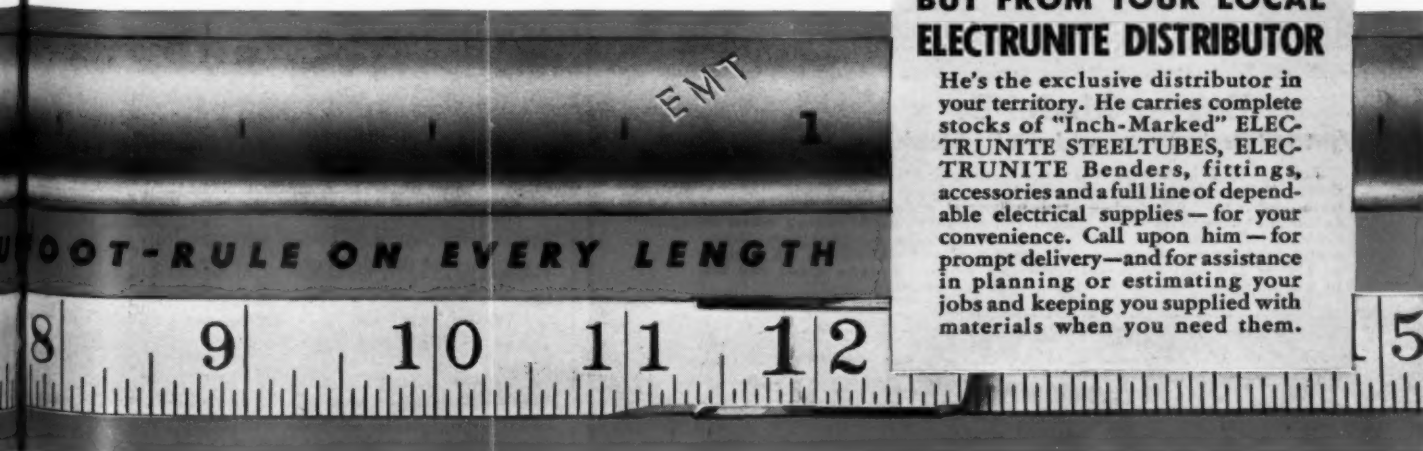
Aided by these three exclusive advantages, any good mechanic can make true bends and accurate cut lengths—without need for guesswork—with less chance for error and waste of material. Work is made easier—and the job can move along to completion without schedule-disrupting time losses due to made-over bends and cuts.

Try "Inch-Marked" ELECTRUNITE STEELTUBES on your next wiring job—exposed, concealed or in concrete. See for yourself how it can save you money—and why it is the easiest-to-use rigid steel raceway in the world. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.



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## OLD MOTORS RUN AGAIN

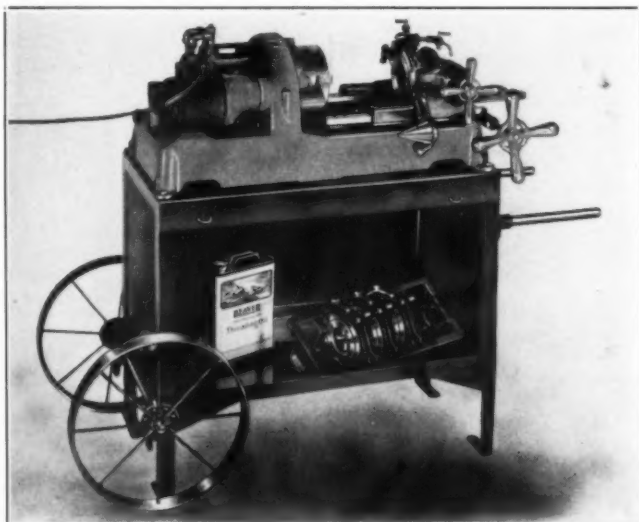
No matter what size or make of motor, there is a Bunting Bronze Bearing to fit it instantly available from stock. These readily available, inexpensive Bunting Bearings have enabled a lot of retired veterans to join up for active duty. Ask your wholesaler. Write for catalog. . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.



They slip right in. Bunting stock Electric Motor Bearings are made to exact original design and dimensional specifications.

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$\frac{1}{8}$  to 2-inch Pipe and Bolt Machine

For  $\frac{3}{8}$  to 2-inch pipe— $\frac{1}{4}$  to  $1\frac{1}{2}$ -inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.

Write for Bulletin B.

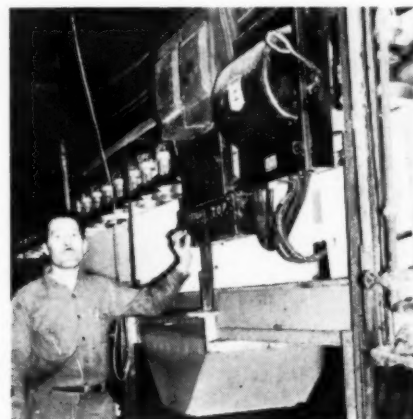
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priced  
—  
portable  
—  
powerful  
—  
speedy  
—  
rugged

the current generated by the photocell maintains a sensitive relay in its open position. However, should the oil flame fail, the sensitive relay closes, and a power relay, which it controls, actuates the solenoid and immediately shuts the oil valve.

## Radiant Energy Dry- Finishes Steel Strip

Cold rolled steel strip made by the Philadelphia Steel and Wire Corporation for toys, edgings on boxes, venetian blinds, etc., is dried after enameling or lacquering. Drying time is cut



PHILIP ROCCO, in charge of the enameling department, is seen at the pushbutton controls. The addition of the white asbestos board has increased temperature 100 deg F and reduced maintenance from fumes given off by a pickling operation.

in half by running the steel strip between two closely set banks, fifty each, of infra-red lamps (250-watts, 105,120-volts).

The big advantage of the pushbutton controls is that heat can be turned off at any group of 10 lamps instantly when a splice has to be made in the strips, to prevent overbaking and discoloring.

## Maintenance of Nurses Call Systems

By Albert A. Schuhler

While there are a number of different nurses call systems on the market, the general results obtained in operation remain the same. These systems however, may be divided into three groups—the locking button type, the magnetic type and the pull cord type. Trouble shooting on these systems is discussed below.

In the locking button and the magnetic type, parts may be replaced to a large degree. In the pull cord type,

however, it is generally acknowledged that it is less costly to replace the entire station in the event of serious failure.

The following faults are among the most common, and suggestions are given to correct them—

**A—Buzzer fails to operate from all points.**

- 1—Adjust buzzer.
- 2—Check for loose connections at audible signal.
- 3—Check for open-circuit in common buzzer wire.

**B—Buzzer fails to operate from one point.**

- 1—Examine for poor contact on buzzer contact springs in locking button, magnetic switch, and tumbler switch.
- 2—Examine portable cord for broken buzzer wire to button or to connecting plug, in locking button type system.
- 3—Test for broken buzzer wire between patient's station and door lamp station.
- 4—Check for loose connection of buzzer wire at station.

**C—Lamp fails to operate in annunciator or door lamp station.**

- 1—Check for burned-out lamps.
- 2—Check for loose wire at annunciator and door lamp station terminals.
- 3—Test for broken wire between door lamp station and annunciator.
- 4—Check for poor contact on lamp springs in locking button, magnetic switch and tumbler switch.
- 5—Examine for broken wire in portable cord or to connecting plug in locking button system.
- 6—Check for loose connections of lamp wire at station.

**D—Lamp and buzzer fail to operate from all points.**

- 1—Check for weak battery, defective transformer, defective battery eliminator or blown fuse.
- 2—Test for open, short-circuited or grounded feed wire from source of current supply.
- 3—Examine terminals for loose connections at main terminal strip.

**E—Lamp and buzzer fail to operate from one point.**

- 1—Examine for poor contact on battery feed contact spring in locking button, magnetic switch and tumbler switch.
- 2—Examine for broken battery feed wire in portable cord to button or connecting plug in locking button system and magnetic system.
- 3—Test for broken battery feed wire between patient's station and door lamp station.
- 4—Check for loose connections to station.
- 5—Check all magnetic coils for burn-out.
- 6—Check magnetic switch for poor connections on throw-over contact.

**F—Ward station lamp fails to operate.**

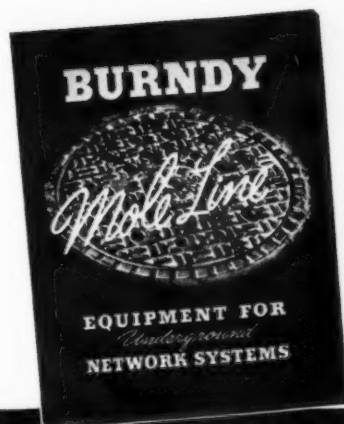
- 1—Check for burned out lamp.
- 2—Examine jumper wire and terminals from station terminal and lamp.
- 3—Examine for broken lamp section wire in portable cord to button or connecting plug in locking button system.

**G—More than one lamp lights on annunciator from one point.**

- 1—Examine terminals in annunciator for crossed or grounded wires.
- 2—Test for crossed or grounded section wires between rooms involved.

**H—More than one door lamp station lights from one point.**

- 1—Test for crossed or grounded door lamp wire between rooms involved.



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INSULATIONS**

## BURNDY ENGINEERING *specifies* OIL STOP

- 7 Insert cable ends in Limiter sockets and indent in place with Hypress.
- 8 Wrap Limiter sockets, cable insulation and about 1 inch of lead sheath with two or three layers of 1/4" varnished cambric tape, coating each layer with Harvel Oil Stop or equal.
- 9 Place Asbestos Shells over Limiter being careful to center the shells on the fusible section.

In the Burndy Engineering Catalog on Mole Line Equipment for Underground Net Work Systems, **OIL STOP** is mentioned on Page 13 for use with installations of Burndy Limiters on Oil Impregnated Paper Insulated Cable.

**OIL STOP** is a phenol-aldehyde synthetic resin which has many uses in the electrical industry for cable splicing, low cost oil tight terminals, stop joints, insulating buses, cementing transformer gaskets, repairing cracked bushings, coil sealing, waterproof coatings, etc.

**OIL STOP** has the following qualities: completely seals against any kind of oil or water; easily applied as a liquid, yet polymerizes at ordinary temperatures into a firm enduring, infusible insulation—whether exposed to air or not; forms no vapor pockets during polymerization—being free of solvents; will not melt or soften after setting; resists vibration; has excellent adherence to rubber, oil-impregnated paper, molded plastics and fibre; has good adhesion to copper; and is not affected by acid or alkali solutions.

**Supplied in the following container sizes:**

#0 (1/4 pint); #1 (1/2 pint); #2 (1 pint); #3 (1 quart).



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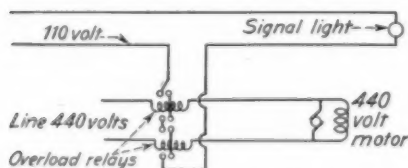
# Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

## ELEVATOR BUCKET

**Q** QUESTION 13. We have a bucket elevator which sometimes breaks from overload. The motor pulls it through a gear and is large enough so that it breaks the chain without being slowed down enough to notice. Is there any way I can fix a signal to tell the operator that the load is getting heavy enough to break the chain? It's a 440 volt motor. A light tells if the motor stops but not if the chain breaks.—H.D.M.

**A.** TO QUESTION 13. Use an overload relay. If it is a three-phase line, use two overload relays in series, hooked up to have the light in series with the overloads. Either make the light go on with an overloaded motor or connect to have the light go out with an overload. The following diagram will show what I mean.—M.J.S.

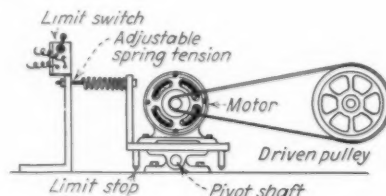


**A.** TO QUESTION 13. I suggest that a wattmeter be placed in the motor circuit. The operator can watch the wattmeter and shut the motor off when the meter reaches a predetermined figure. Unless the motor is extremely large for its load, a wattmeter will warn the operator in time even though the motor shows no signs of slowing down.

Or try this—Have a bucket elevator which has a smooth drive wheel over

which the chain runs. When the load becomes too heavy, the chain slips on the drive wheel and the elevator stops, thus preventing a break down.—C.L.B.

**A.** TO QUESTION 13. I had trouble of similar nature. I mounted my motor on a tilt base with a v-belt drive, and an adjustable spring tightener on the base. I adjusted the spring so that when the motor pulls overload the base tilts and allows the belts to slip. I mounted a limit switch on the base to turn on a light when the base tilted.—L.A.



**A.** TO QUESTION 13. Perhaps your motor and protective equipment, (overload relays) are too large for their job. Or the overload relays may be set too high to properly protect the motor. I am assuming that you refer to a squirrel-cage motor.

You may install a signal to tell the operator when the elevator chain is becoming overloaded, before the overload relays on the starter or circuit breaker operate to shut down the motor. Use an extra overload relay in series with one of the line wires, set for a lower current rating than the motor protective relays. This relay should be of the solenoid or dash-pot, automatic resetting type, with contacts closing when operated due to a predetermined overload. The contacts of this relay may be used to close or open the signal circuit under load conditions.—L.H.M.

## POWER FACTOR

**Q** QUESTION 14—We have 56 motors totalling 577 hp. ranging from fractional to 25 hp. synchronous. We have ample copper capacity but we believe we could improve our power factor.

We have eliminated line shafts and all machines are now individually driven. It was necessary to use the line shaft motors for individual drives and these are larger than necessary and have poor power factor. In addition, we have ten lighting transformers ranging from five to ten kva.

Which would be cheaper or more practical, to purchase proper size motors to replace the large ones now in service or install capacitors?—R.E.G.

**A.** TO QUESTION 14. Make a systematic check of motors and loads rearranging motors so each motor will have a suitable load as far as possible. Now, if the under loaded motors are 5 hp. or over operating at 75 per cent load or under with speeds of 1200 r.p.m. or under, they should be exchanged with some motor service house for suitable new or good modern used ones. This will give a marked improvement in power factor possibly enough to be satisfactory. If so, it would be the cheaper method.

If these larger motors operate at over 75 per cent load or if the underloaded motors are smaller than 5 hp. and if the fractional horse-power motors are mostly single-phase the cheaper method would be a bank of three-phase capacitors at the load center where the power factor is poorest as most small motors have poor power factor at test.

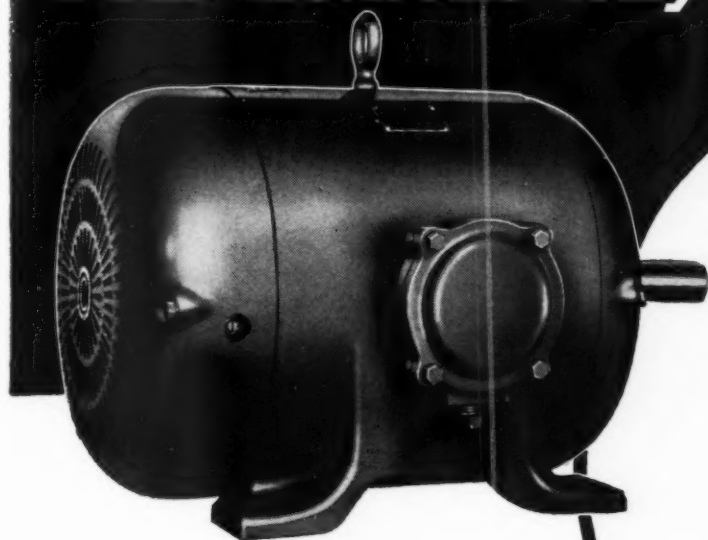
The power factor of most transformers is fairly high so they can be forgotten.—G.L.S.

**A.** TO QUESTION 14. Exchange the oversize line shaft motors and all other oversize motors for motors of proper size. In this way you will boost the overall efficiency of your plant and at the same time raise the power factor somewhat.

Power factor correction equipment will pay for itself, where there is a penalty for poor power factor. By getting the proper size motors in use you will also decrease the size and the cost of the power factor correction equipment.

If there is no penalty then there is little advantage in spending money to correct the power factor as long as there is no bad line loss. However, it is excellent engineering practice to have the individual drives correctly motored and whatever expense and trouble it

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For atmospheres containing explosive mixtures of gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors or natural gas, call for Century *Job Selected* Explosion Proof Motors. Designed to meet varying degrees of explosion hazards, these new and improved Century Explosion Proof Motors carry Underwriters' Laboratories approval for Class I, Group D, hazards.

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# P. R. MALLORY & CO. Inc. MALLORY

## Reader's QUIZ

[FROM PAGE 58]

will be to trade the large motors for used motors of the right size will be quickly repaid in increased overall efficiency.—E.R.S.

**A.** TO QUESTION 14. I would suggest, first, operate the synchronous motors to get the maximum power factor correction. Second, if this is not sufficient replace with smaller motors, all induction motors operating below half rated load. Third, if still further power factor correction is needed, install capacitors. It is seldom necessary to correct to better than 85 or 90 per cent p.f.—F.C.

**A.** TO QUESTION 14. Undoubtedly in immediate cost it would be much cheaper to install capacitors. Also it would be much easier, as the redesigning of motor bases throughout a plant as large as this will be a considerable task. Looking at the problem from this angle, we see capacitors as the logical answer. However, since the object of plant operation is to keep operating costs as low as possible we must remember that the efficiency of motors drops sharply with load. Therefore it would be necessary to determine by test or to approximate by estimation the savings in power by using the proper size motors. The yearly cost of waste power balanced against the cost of the change in size of motors will determine whether or not the change is advisable.—J.D.P.

**A.** TO QUESTION 14. If you generate your own power and have ample generating capacity and distribution capacity, I would not make any change. If you purchase power and pay a power factor penalty on oversized motors, fractional and larger, you can install the capacitors on a 2300-volt or 440-volt system and save more than by changing the motors. If the capacitors must be installed on a 220-volt system, the excessive cost of correction might offset the saving.

I suggest you get all your data on load, power factor, and power costs together and present it to your utility company or some manufacturer for their recommendation.—R.C.M.

## LIGHTING MACHINERY

**Q**UESTION 15. We have a number of machines in a crane runway 50 by 100 feet. They were not provided with lighting because the building is of "all window"

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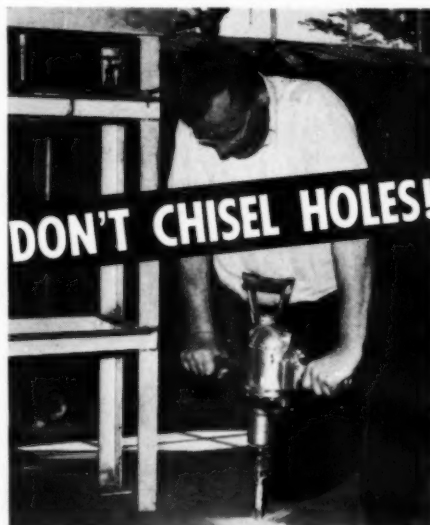
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## CARBOLOY MASONRY DRILL-POINTS

Electrical Contracting, July 1941

construction, and no night work was contemplated. The machines are lathes, planers and shapers, doing rough and semi-close work. The operators are unable to see close work on cloudy days.

We need overhead lighting with fixtures that will clear the traveling crane. But the management frowns on fixtures using more than 300 watts or too many lights burning. So we have run under-floor lines to some machines and provided flexible arm fixtures with 50 watt bulbs. The cords are tangled and broken. Bulbs disappear.

How can we properly illuminate these machines without making the meter spin? The clearance from floor to top of crane is 30 feet.—R.E.G.

**A.** TO QUESTION 15. Use flexible arms that are similar to Greenfield, with threads on each end. By equipping one end with a pull chain socket and fastening the other end into a conduit box, the cords are well protected from tangling.

The disappearance of bulbs can be corrected by the use of lock type reflector guards that can be opened only with a key. The use of this type guard will also increase the light upon the work.—I.J.L.

**A.** TO QUESTION 15. We use mercury vapor lamps in the machine shop and in the assorting room because it does not throw a glare. It is easier on the eyes and more economical to operate.

These lamps are placed above the crane runway on the roof trusses. They are 400 watt, 250 volt mercury vapor lamps in Millite luminaire reflectors. The installation cost is very high, but the operating cost is low.—H.F.H.

**A.** TO QUESTION 15. In one shop this problem is being solved by the use of localized fluorescent lighting. Adjustable light standards have been devised that give any desired position for the fixture. The standards are securely fastened to the floor behind the lathes. The conduit for the lighting circuits extends slightly above the standard and provides a convenient outlet. A levolver switch is placed in one end of the fixture to control the light.—L.H.M.

**A.** TO QUESTION 15. Rig up two pieces of pipe seven feet long making an H fixture on each machine on which to suspend a two or three lamp fluorescent unit using 30 or 40 watt lamps. Or, if machines are lined up far back from crane,

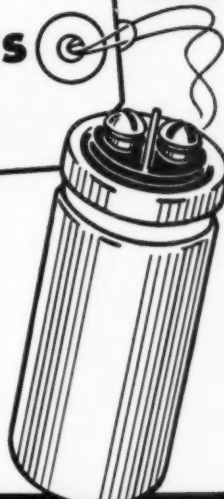
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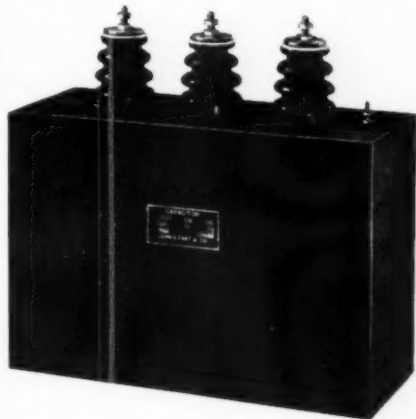


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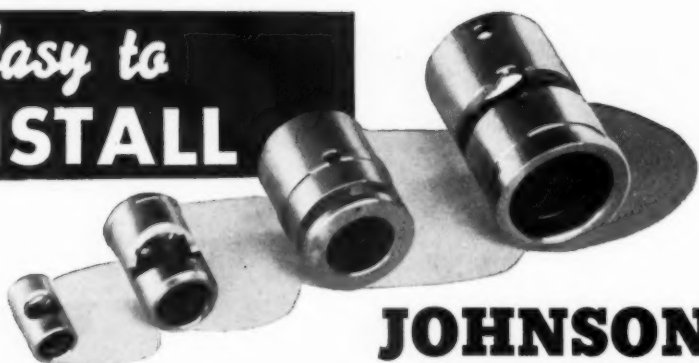
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WITH B-M CONNECTORS AND COUPLINGS**

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**BRIEGEL METHOD TOOL CO., Galva, Ill.**

## Reader's QUIZ

[FROM PAGE 61]

install a 3/8-in. guy wire directly over the machines, the length of the building, high enough to be out of the operator's way. Pull the guy wire tight and make secure. Hang two or three lamp fluorescent fixtures where needed, using flexible or thin wall conduit to feed from floor boxes to each one, or several units, according to the space and clearance available.—W.H.L.

### Can You ANSWER these QUESTIONS?

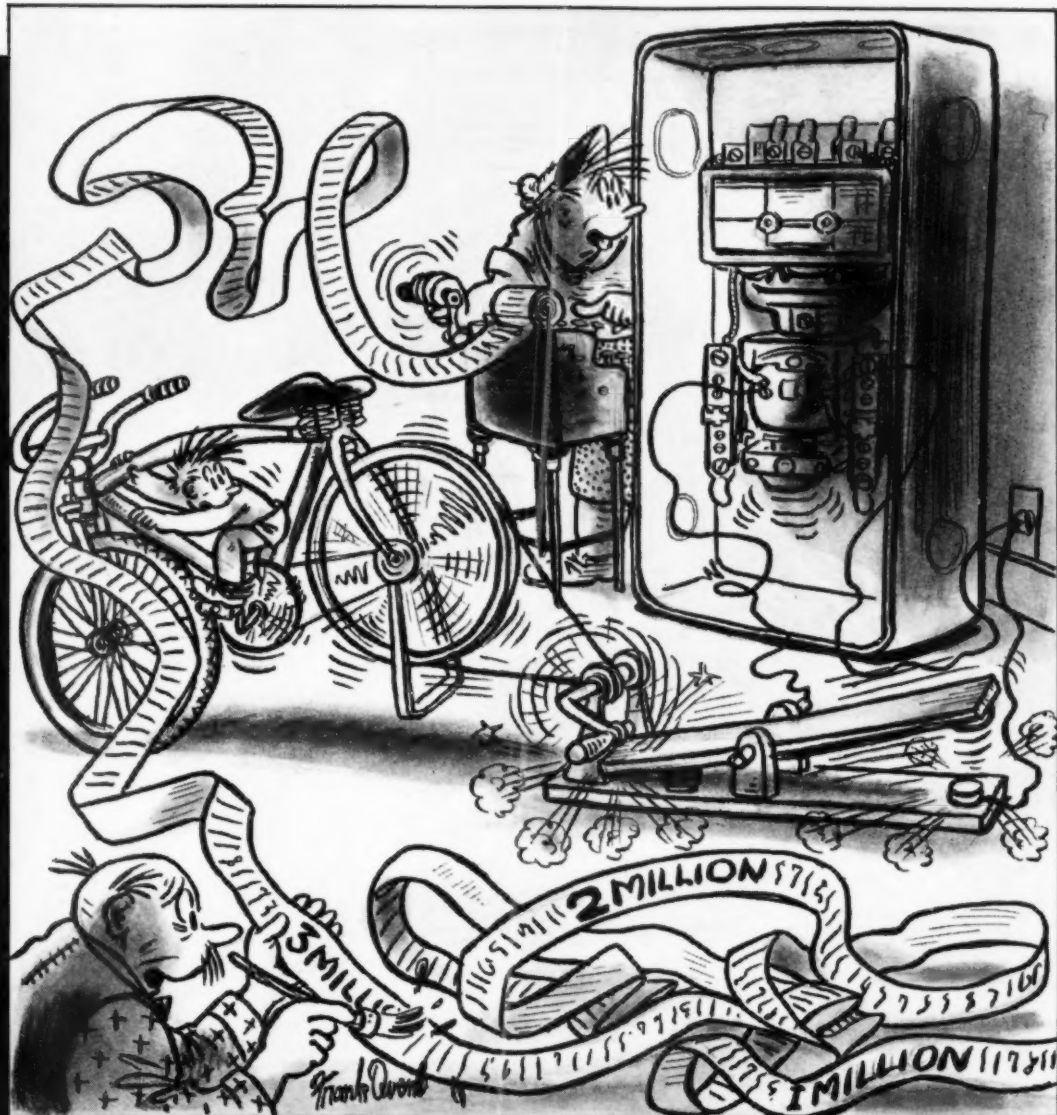
**QUESTION N**—Can a fluorescent lighting fixture of reputed make be definitely accused of causing radio interference and noise when installed properly on a polarized and grounded system? Will twenty such fixtures increase amount of noise very much more than only one or two? If so what is the remedy?—B.E.S.

**QUESTION O**—In the use of mercury for time delay switches, and the usual mercoid switches, the inside of the mercury cylinder in time becomes coated with a dirty film, and this film hinders and impairs the operation of the device. Since the cylinder is air tight, how can the film accumulate? How can it be prevented?—W.E.J.

**QUESTION P**—Is it true that the residual magnetism in the field poles of a direct-current generator, while standing idle, is of one polarity, whereas when this machine is run at full speed the polarity is opposite?—W.B.

**QUESTION Q**—At a carbon plant, where gas is burned, the "soot" is collected with precipitators, at 55000 to 75000 volts. How can the unidirectional voltage go through the precipitators and get back into the a.c. with a power factor? We have 440 volt, 3-phase a.c., transformer, a mechanical rectifier which is a semi-synchronous motor and a set of charged wires hanging between plates which are about four inches from the wires. So that leads to another question. Would this act as a condenser even though it is practically direct current?—H.D.M.

**PLEASE SEND IN  
YOUR ANSWERS BY AUGUST 1**



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Motor starters fail when bearings wear out . . . when flexible jumpers break . . . when pivots stick . . . when contacts corrode. Only by eliminating bearings, jumpers, pivots, pins . . . only by doing away with contact maintenance can you get millions of trouble-free starter operations.

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one moving part. There are no bearings, pivots, pins, or jumpers. The cadmium silver alloy, double break contacts never need cleaning, dressing, or filing. When you install an Allen-Bradley solenoid starter, you are guaranteed millions of trouble-free starter operations.

Just install 'em . . . and forget 'em!



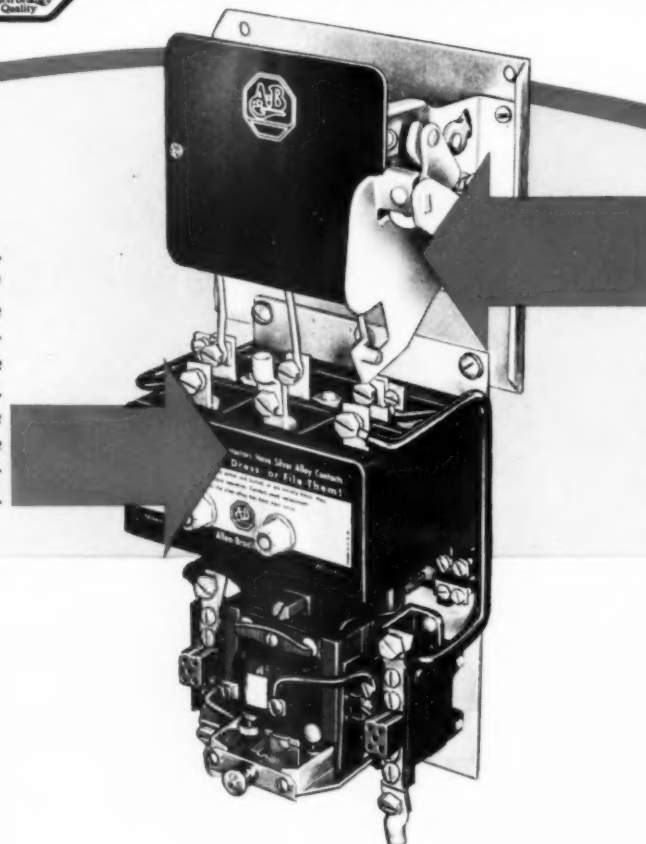
The Allen-Bradley Combination Starter, shown above, combines disconnect switch and solenoid across-the-line starter in one cabinet. This compact unit simplifies your wiring installation. The safety interlock makes it necessary to move the disconnect switch to the "OFF" position before the cabinet can be opened. Send for Bulletin 712-713 describing the Allen-Bradley line of combination starters.

**ALLEN-BRADLEY**  
**SOLENOID MOTOR CONTROL**  
 QUALITY

# What every electrician should know about COMBINATION STARTERS

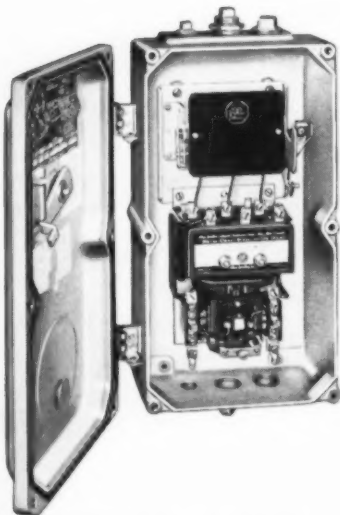
## STARTING SWITCH

All Allen-Bradley Combination Starters are equipped with Bulletin 709 solenoid starting switches. Double break, silver alloy contacts eliminate contact maintenance and assure millions of trouble-free operations. Dependable thermal relays give accurate overload protection. The overload relays can be reset by workmen without opening starter cabinet.



## DISCONNECT UNIT

The most popular type of Allen-Bradley Combination Starter is equipped with a manually operated disconnect switch. For short circuit protection, fuses can be furnished. Where momentary current peaks may occur frequently, the Bulletin 713 Combination Starter with ITE instantaneous circuit breaker (shown below) will most economically handle the job.



## WATERPROOF ENCLOSURE

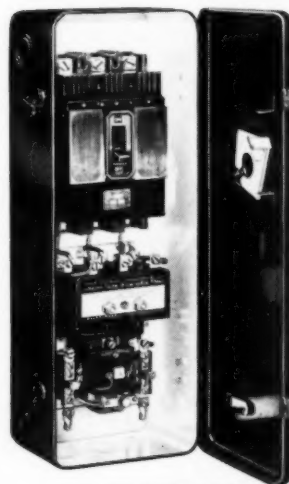
This NEMA Type 4 enclosure is typical of the variety of combination starter cabinets available for every service. The general purpose enclosure is of sheet metal with white interior. There is generous wiring space in all Allen-Bradley starter cabinets.

Allen-Bradley Combination Starters are a combination of a manually operated disconnect unit and a solenoid operated motor starting switch. They offer many advantages in industrial service.

It takes less time to install a combination starter than two separate switches. It also takes less space. When changes are made in plant layouts, machines equipped with combination starters can be moved with minimum disturbance to motor wiring, because disconnect unit and starting switch are in one cabinet.

Allen-Bradley Combination Starters make neater installations. And they are safer, too, because the switch lever is interlocked with the disconnect unit so that the cover cannot be opened unless the starter is disconnected from the line.

Write for Bulletin 712-713 giving complete information on Allen-Bradley Combination Starters. Allen-Bradley Company, 1307 S. First St., Milwaukee, Wis.



## CIRCUIT BREAKER IN COMBINATION STARTER

Allen-Bradley Combination Starter with Instantaneous Circuit Breaker is used for installations where the high fuse replacement costs make circuit breaker protection more economical.



If two or three departments are responsible for plant safety, each department may attach its own padlock to the disconnect lever. Machine cannot be started until all locks have been removed.



# ALLEN-BRADLEY COMBINATION STARTERS

QUALITY

# Estimating

## SNAP-IN FLUORESCENT TROUGHS

The Hixon Electric Company, electrical contractors and engineers of Boston were recently called on to install several thousand feet of fluorescent troughs in a large commercial building. The troughs were the type that snap into the small steel channels that support a suspended acoustical tile ceiling.

These reflectors, mounted end-to-end to form continuous open troughs across the width of the rooms, were furnished in 8-ft. and 4-ft. sections. The 8-ft. ones contained two 40-watt lamps mounted end-to-end, the others one lamp.

Each unit was individually connected to the branch circuit outlet by a length of flexible steel conduit. All of these jumpers were made up in groups before the units were mounted and are not included in the labor data given below.

The units, mounted flush in the hung ceiling, were installed at the same time as the ceiling acoustical blocks. The electricians used the same platforms and scaffolding as the men working on the ceiling.

The following labor data was recorded for future reference:

**INSTALLING TROUGH SECTIONS**—includes making the electrical connections at the trough end of the flexible conduit jumper, snapping the section in place, making connections at the branch circuit outlet and aligning trough sections. Each 8-ft. section weighed approximately 55 pounds, the 4-ft. sections weighing correspondingly less. Two men were required.  
Average time per section..... 0.417 m.h.

The time required for making up the flexible conduit connecting jumpers is not included in the above unit.

Data from Hixon Electric Co., Boston, Mass.

## HOUSE WIRING COSTS

Down Virginia way, in the historic town of Alexandria, the electrical contractors have developed a system of unit prices for house wiring that en-

ables them to do a real job and still make a fair profit.

Based on past experiences, J. Kent White, Alexandria contractor who has wired more than 600 houses in the past three to four years, uses the following units to figure his house wiring jobs. These units, as listed, are applied to an average six room house.

### RESIDENCE WIRING COSTS

**OVERHEAD SERVICE**—includes a 60-ampere service with entrance switch and distribution center and a 1-inch conduit entrance service and range outlet ..... \$35.00

In areas where the utility installs service entrance cable to the service equipment the price is \$27.00.

**INSTALLING OUTLETS**—includes fixture outlets, ordinary convenience outlets and switches. An average of 60 outlets per house.  
Total cost ..... \$82.50  
Average per outlet..... \$ 1.375

**HEAVY DUTY OUTLETS**—includes the installation of an average of six heavy duty appliance outlets per home.  
Total cost ..... \$14.25  
Average cost per outlet..... \$ 2.375

**OIL BURNER WIRING**—includes the wiring necessary for operation of oil burner.  
Total cost ..... \$9.00

**WATER HEATER WIRING**—includes the wiring necessary for operation of water heater.  
Total cost ..... \$7.00



**PULLS IN BIG ONES.** Alfred Elson, estimator for the electrical construction branch of New England Machine and Electric Co., Pawtucket, R. I. catches some choice jobs in his territory. Latest success, the recently acquired fiberglass plant of Owens-Corning Fiberglass Corp., at Ashton, R. I.

**HANGING FIXTURES**—includes hanging an average of 12 fixtures per home.

Total cost ..... \$4.00  
Average cost per fixture..... \$0.34

In addition to the above the contractor sells the home owner the fixtures, ranges, water heaters, refrigerators and appliances.

The above figures, of course, are based on local conditions and are cited only as a guide to house wiring estimating.

Data from J. Kent White, Alexandria, Va.

## INSTALLING BRAZED

### SQUARE BUS BARS

The following data are gathered from experience on the installation of a square copper bus bar secondary distribution system in a commercial building. The system consisted of a duct system through the basement from two transformer vaults feeding four riser ducts. The installation was handled from rolling scaffolds and ladders. The bus system consisted of square buses, 3 by 3 by 1/4-in. for the three phases and one 3 by 3 by 1/4-in. bus on the neutral. They are installed in 4-in. ebony asbestos supports on six foot centers.

All cuts and miters for the corners were worked out on detailed drawings and the pieces arrived on the job ready to install and keyed to the master drawing. The following is the list of materials.

Total amount of 3 by 3 by 1/4-in. copper used—32,810 lb.

Total amount of 3 by 3 by 1/8-in. copper used—5,661 lb.

Total amount of 1/4 by 4-in. rectangular copper used—6,146 lb.

The labor cost for installing the supporting inserts, 5/8-in. rod, channel iron and ebony asbestos support, placing copper bus in hangers ready for welding or brazing, averages 15 lb. of copper for one man hour labor.

Brazing joints with included time for setting up a moving scaffold and the welding tanks, took 1.5 man hours for each welder and helper for a total of 3 man hours per joint. Some joints on the bus were rather difficult to reach in order to braze and some rather awkward positions were encountered. All this is included in the above time allowed.

Welding 90 deg. joints, most of which were done on the floor, amounted to 2 man hours per joint for welder and helper for a total of 4 man hours per joint. Each joint required 21.3 cu. ft. of oxygen and 19.1 cu. ft. of acetylene gas.

Drilling holes in the bus and bolting 3,000 amp. expansion joint required 3 man hours for each joint.

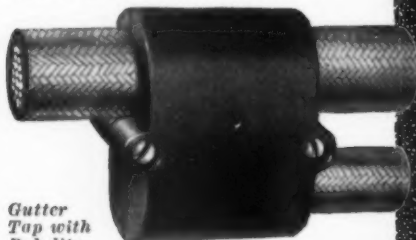
Installing the steel framework and 25,291 lb. or 4,772 sq. ft. of 1/2-in. asbestos Transite average .4 man hours per sq. ft. of Transite.

The above figures are on-the-job costs and there is no allowance for

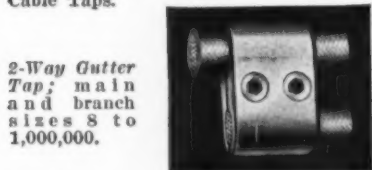
## The MOST COMPLETE LINE OF *Cable Taps*

Parallel and 90° taps—and combinations—for the widest variety of applications. For conductor sizes up to 1,000,000 CM.

Now you can select from a really complete line of standard and special taps. Carefully designed—made right—and giving excellent service to all classes of users.



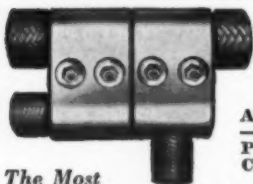
**Gutter Tap with Bakelite Cover.** Insulating covers can be furnished for all types of Penn-Union Cable Taps.



**2-Way Gutter Tap;** main and branch sizes 8 to 1,000,000.



**Two Separate Parallel Taps** to a continuous main conductor.



**Combination Cable Tap;** one branch tap parallel to main, and one at 90°.

And many more—write for the **PENN - UNION Catalog.**

**The Most Complete line of Service Connectors—Terminals—and thousands of other fittings, for all requirements.**

Penn-Union is the choice of leading utilities, "industrials," and manufacturers of electrical equipment.

**Sold by Leading Jobbers  
PENN-UNION  
ELECTRIC CORPORATION  
ERIE, PA.**

# PENN-UNION

Conductor Fittings

## Estimating

[FROM PAGE 65]

supervision, lost time or the other factors which are not directly associated with the operation.

*Data from Fries-Walters Electric Co., Chicago, Ill.*

### CATALOG FILING

The kind of filing layout that every estimator is going to have some day actually took shape for estimator A. W. Pierce of Eugene Ashe Electric Co. in Ft. Worth, Tex. When the new building was planned, one solid wall of the estimating office was laid out for filing. The accompanying photo shows the results.

At the right, blue-print drawers hold prints and tracings of current jobs. Above, 5½ by 5½ pigeon hole racks provide storage for rolled plans and



**FILING LAYOUT** in estimator's office provides plan drawers, finished job storage and complete catalog indexing.

completed work. The rack consists of two wood grids, open between, making it impossible to lose or bury plans in the file. Shelves, one foot wide, at the side of the rack are for specifications pertaining to jobs in the adjacent drawer or rack.

Over the rest of the wall, from floor to ceiling is a catalog file. Shelves are divided into four foot sections, 13½-inches high and 9½-inches deep. Separators divide the shelves into 1½-in. space with brass card holders above.

Each firm name is typed on a card as catalogs are received and marks the space assigned. Separations are easily removed if the catalog material becomes too bulky for one slot.

## The reason why his pliers are **KLEIN'S**



"Since 1857"

**IT'S** more than chance—more than habit that places Klein's in the hands of electricians—everywhere!

Compared to mass production methods, the Klein craftsmen way of building each plier individually may seem unnecessarily slow—unnecessarily painstaking. But the truth remains there is no other way to produce a plier of Klein quality. And the slight additional cost of a pair of Klein's is a small price to pay for the plus service they render.



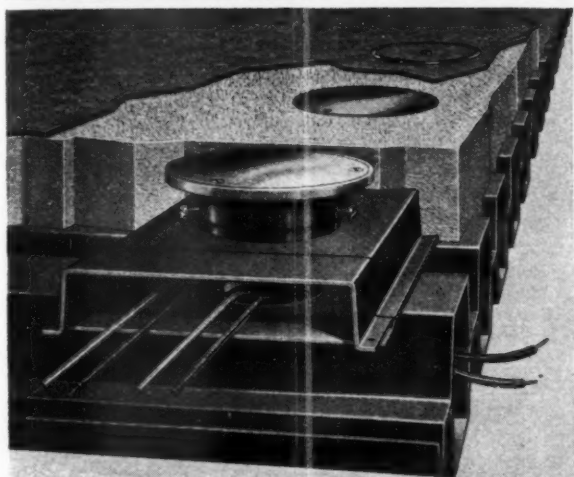
Your copy of the Klein Pocket Tool Guide will be sent on request.

**ASK YOUR SUPPLIER**

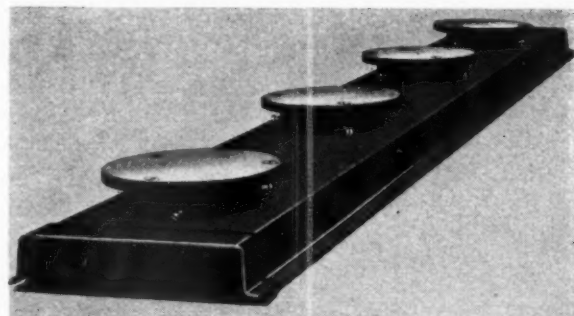
Foreign Distributor:

International Standard Electric Corp., New York

Mathias **KLEIN** & Sons  
ESTABLISHED 1857 CHICAGO, ILL. USA  
3200 Belmont Avenue, Chicago, Illinois



Showing details of adequate wiring in Robertson Q-Floors which makes it possible to install electrical floor outlets in any 6-inch square over the entire floor area. Note details in large illustration above.



Showing details of the new standard Floor Header with hand holes through which every large-capacity, steel enclosed wireway in Robertson Q-Floors can be reached.

## ROBERTSON Q-FLOORS

### ...YOUR CUE FOR GREATER PROFITS

Because Robertson Q-Floors provide the answer to **ADEQUATE WIRING** and place you in a position to serve the best interests of your customers... they invariably result in *greater profits* for you. Only by fully meeting every electrical requirement of the building owner and his tenants, which means "Consumer Satisfaction" can true success in business be attained. Robertson Q-Floors help you do exactly that!

The service you render should keep buildings from becoming electrically obsolete and should not only meet present needs but provide for every new electrical development in the future. Again Q-Floors help you.

Study the illustrations shown here and you'll quickly see how Q-Floored buildings are electrically **ALIVE**. Robertson Q-Floors help cut down your overhead because the crews work continuously. There is no reduction in productive labor and materials. Detailed drawings and descriptive data furnished on request.

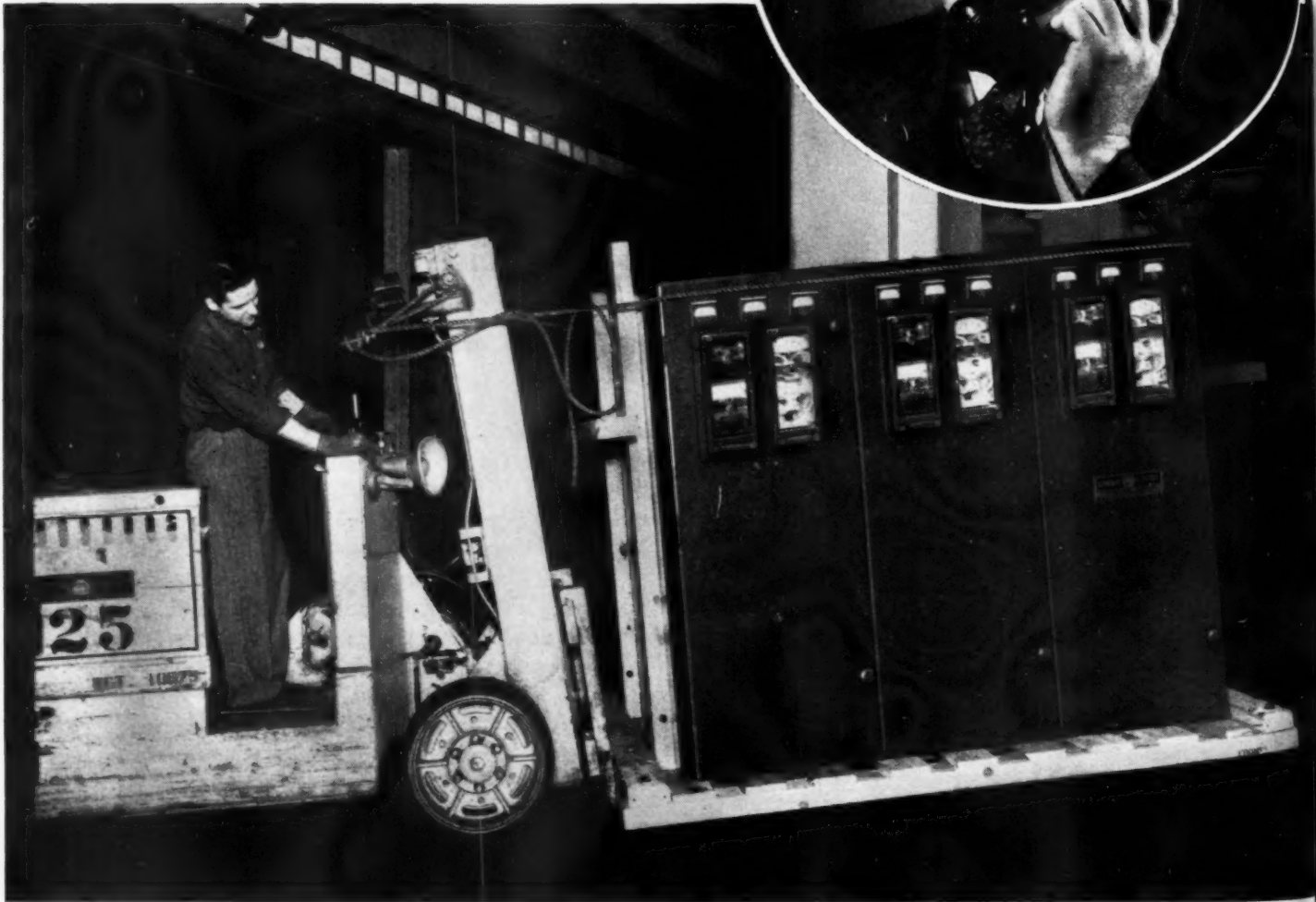
H. H. ROBERTSON COMPANY • FARMERS BANK BUILDING • PITTSBURGH, PA.

# ROBERTSON Q-FLOORS



# *metal-clad switchgear*

**1** "Four weeks? Fine! That'll give us time to get the cables in."



**2** There it is, all ready for you to roll it into place and connect the cables—right when you need it.

# *NOW shipped in 4 weeks*

## **(INSTEAD OF SEVERAL MONTHS)**

**T**HIS reduction in shipping time for low-capacity Type MI-9 metal-clad was made possible by standardizing units that *adequately* meet industry's requirements for incoming lines and feeder circuits (up to 2300 volts).

This is a real contribution of our Switchgear Division to the defense production lines of America. Last year their contribution was a 25 per cent reduction in the price of these small and medium-sized metal-clad units.

Now you can get the finest switchgear built—completely factory-assembled—all ready to be bolted down and have the cables connected, utterly safe and dependable, at bed-rock prices because of standardization, and all this in new record-breaking time.

All your power goes through your switchgear. Haven't you some obsolete gear that should be replaced today? Talk to your G-E salesman. General Electric, Schenectady, N. Y.



### **3**

**Power's on! Months saved, and you have a completely co-ordinated, factory-tested, dependable equipment.**

ALL YOUR POWER GOES THROUGH YOUR SWITCHGEAR  
*Play Safe with*  
G-E METAL CLAD

**GENERAL  ELECTRIC**  
254-13-700

# Better Lighting

## MULE SPINNING

Mule spinners are set up in a room 50- by 152-feet at the Uxbridge Worsted Company, Uxbridge, Mass. The area is lighted by 25 continuous rows of Miller Troffers. Each row is made up of 12 four foot Troffer sections—each section using a 40-watt, 48-inch



*MULE SPINDLES in this spinning room are bathed in 35 foot-candles of evenly diffused fluorescent lighting, provided by continuous trough units.*

white mazda Fluorescent lamp—a total of 300 lamps for the entire area. Rows of units are spaced 6-feet apart and are suspended 4-feet average from ceiling by chain running from center of each 4-foot Troffer section. The average ceiling height is 13 feet. Illumination at mule spindles, 35 foot-candles and at back roll of mule, 45 foot-candles.

## LIGHTING DISPLAY ROOMS

The lighting in the 5th Avenue display rooms of the International Silver Company, installed by Coe Electric Company, reveals the beauty of the silverware displayed and creates a quiet, friendly atmosphere in which the buyer can make his selection.

Five rooms are lighted occupying

5000 square feet. The table displays are lighted by daylight fluorescent lamps in special units of the Frink Company. These units are equipped with three rows of 24-inch lamps; the outside rows in the daylight and the inside row in white, with a total of 15 lamps.

The wall displays are lighted by a long trough containing a double row of 20-watt daylight fluorescent lamps. There are a total of 582-20-watt lamps used in the installation. The level of illumination provided on the displays is of the order of 30 foot-candles.

## LIGHTING AN AUTO LIFT

A good lighting system for lifts involves well diffused lighting to insure freedom from shadows at all times during the work. The units should, of course, be so placed that they do not interfere with the movements of the attendants. Movable or portable units placed on the lifts or the floor below take part of the attendant's time to adjust them for each operation, thereby increasing the length of time required



*LIFT LIGHTING with fluorescent units permanently mounted on the inner edge of the wheel channels. Five to 50 foot-candles of even light is provided at the major grease points.*

for doing the job. In addition, numerous shadows hinder the work.

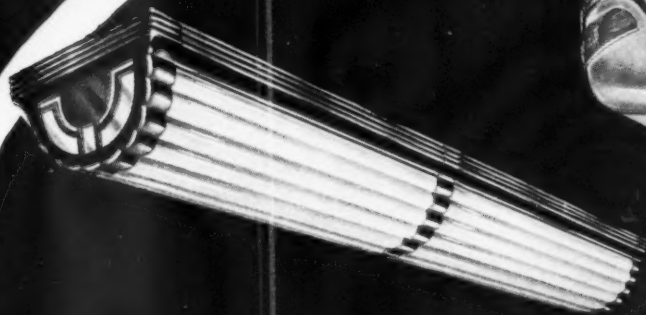
An effective method of lift lighting is to employ fluorescent lamps in equipment attached directly to the lift. An example of this method of lighting is illustrated in the accompanying photograph. The 30-watt, 36-inch white mazda F lamp is employed. Five to 50 foot-candles of well diffused illumination is provided at the major grease points. The low value as may be supposed, is in those somewhat inaccessible points which probably would receive only a fraction of a foot-candle employing the older methods of lift lighting.

## LIGHTING IN THE DEFENSE INDUSTRIES

During World War I, production problems were as important as they are today. At that time every aid to pro-

*DISPLAY LIGHTING of products in this silverware manufacturer's showrooms utilizes fluorescent trough units in the wall cases and suspension units over table displays.*





*The*  
**Kingsway**



*The*  
**Day-Lume**

## *Your Customers* ARE IMPRESSED WITH THIS ENGINEERING SERVICE!

### EVERYTHING in FLUORESCENT

Day-Brite is the complete line in fluorescent... No matter what your requirements may be—standard or special designs—quantities or single units—recessed, ceiling or suspension types—"fill-in" units or continuous runs... they're all in the Day-Brite line—quickly available!

**3** Powerful  
Sales Aids

**Day Brite**  
Trade-Mark Registered... Designs Patented

The "glamour" of fluorescent has vanished... Performance has taken its place!

Now, therefore, Day-Brite's "OVER-ALL" Engineering Service helps you more than ever to make sales that make satisfied customers... This valuable aid—furnished at no cost—analyzes the requirements of each individual installation for proper fixture placement, ultimate light value, illumination intensity, color correction and other vital factors—all based on the accumulated knowledge of more than 18 years' specialized experience in illumination and display.

Put your problems in the hands of Day-Brite Engineers—satisfy your customers with a service that assures scientific "OVER-ALL" illumination!

**Specifications: The DAY-LUME — The KINGSWAY**

*The DAY-LUME*... New, and a beauty for looks... **SUSPENSION TYPE**, four and eight 40-watt lamps; two, three, four and six 100-watt. **DIRECT CEILING TYPE**, four and eight 40-watt lamps.

*The KINGSWAY*... New—with fluted-glass cylinders and die-cast ends... **IN UNITS**, two, four, six and eight ft. long—also continuous for 2 and 3 rows of lamps.

**DAY-BRITE LIGHTING, INC.**  
5439 BULWER AVE. • • • ST. LOUIS, MO.

Manufacturers of **THE Complete Line of FLUORESCENT LIGHTING FIXTURES**  
Distributed Nationally through all Leading Electrical Supply Houses

**ENGINEERING LAYOUTS • DESIGN APPEAL • PRODUCT QUALITY**

# INDIVIDUAL or CONTINUOUS FLUORESCENT Installations with WHEELER RLM LIGHTING UNITS



**RLM TWO-LAMP UNIT**

Wheeler RLM Two- and Three-Lamp Fluorescent Lighting Units are designed to provide general and localized illumination in industrial and commercial areas. These units, which employ 48-inch, 40-watt lamps, can be mounted Individually from chain or conduit; or can be used to make Continuous Run installations. Only a few extra parts are required to convert units into Continuous installations of any number of units desired.

Two- and Three-Lamp Units consist of a wiring channel and a separable porcelain enameled reflector body. Both units are constructed in such a manner that upon removal of the lamps the reflector bodies can be lowered and taken down without disturbing any of the lamp operating equipment.

Units are furnished complete with lampholders, removable starter switches, high power factor ballasts and starting compensator.

This new line of equipment for Individual or Continuous installations is fully described in Wheeler Bulletin #66.



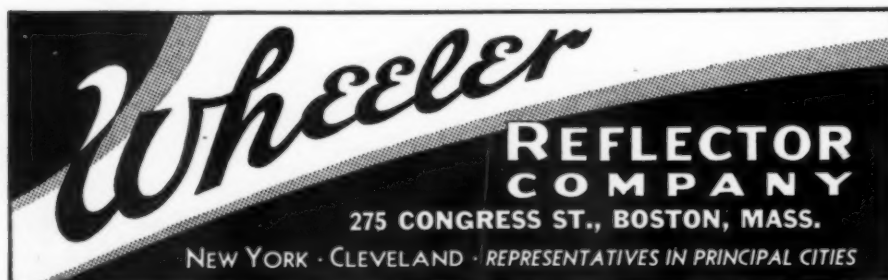
**Send Coupon for YOUR Copy  
of Bulletin No. 66**

**WHEELER REFLECTOR COMPANY**  
275 Congress Street, Boston, Mass.

Please send, without charge, copy of New  
RLM Bulletin No. 66.

Name.....  
Company.....  
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City..... State.....

**Distributed Exclusively Through Electrical Wholesalers**



*Better  
Lighting*

[FROM PAGE 70]

duction was tried; machines were speeded to their breaking point; more machines were installed—and then someone thought of more light. Every test brought the same result—more light, more production. And contrary to the anticipation of many, the value of increased production was considerably greater than the increased cost of the higher levels used.

Defense industries today are profiting from the experience of the past and utilizing every production tool to its fullest. Lighting techniques have changed and industry becomes the



**HIGHLIGHTED DEFENSE** production in an Eastern industrial plant. Employees enjoy 65 foot-candles of evenly distributed cool fluorescent light from continuous rows of open reflectors. Management enjoys increased production and higher quality workmanship.

gainer. Whereas 5 to 10 foot-candles was a good lighting job 25 years ago, today, as evidenced by this illustration of an Eastern defense industry, many times that amount is being provided. This installation employs continuous rows of 2-lamp RLM units equipped with the 40-watt mazda F lamps. The units are on 7½-foot centers and the resultant 65 foot-candles in service enables the employees to see easier and quicker, which is a necessity for most efficient production.

## **LOW BAY SHOP LIGHTING**

The Monarch Machine Tool Company of Sidney, Ohio, makers of precision equipment, have long known of the value of lighting as a manufacturing aid. Their installation of Type H Mercury lamps attests to this fact. This illustration shows an installation of RF fluorescent lamps in a low bay area. The installation employs the 2-

# New



**For Five Foot 100  
Watt Fluorescent Lamp**

**CURTIS**  
*Silverline*  
**CEILING UNIT**

Designed to make the most effective use of the new five foot lamp, Curtis Silver Line provides high intensity interior lighting with exceptionally low surface brightness. This Luminaire is intended for installation on the ceiling in continuous lines. Finish is a

special baked aluminum bronze of high reflection factor. The Silver Line will fit in many places. As a starter we suggest that you go after the large and profitable market in office lighting. Write today for Serial 2038.

**Curtis Lighting, Inc.**

6135 W. 65th Street, Chicago, Ill.

# FLUORESCENT ARISTOCRATS MODERN LIGHTING



GLASS SHIELDED-METAL LOUVRED . . .

This high quality fluorescent luminaire combines original design with the foremost engineering principles in fluorescent. Louvres and pentecor glass shields give you higher levels of indoor daylight without glare or extreme surface brightness. The compelling and aristocratic appearance insure the right decorative fixture for any interior architecture. Fixture is available for 2-48" 40 watt, 2-60" 100 watt or 4-48" 40 watt lamps. Write today for information about our complete new line of fluorescent luminaires. Designed and Fabricated by one of the first and leading fluorescent manufacturers.

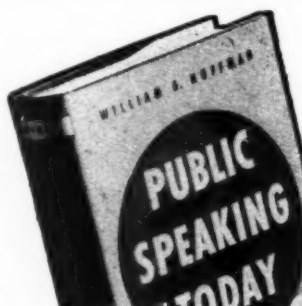
IF IT'S FLUORESCENT, IT'S . . .

**LIGHTING PRODUCTS INC.**  
HIGHLAND PARK, ILLINOIS, U. S. A.

Make them say

*"I'd like to hear you again!"*

Out of many speakers you hear, someone gets up in front of you once in awhile, and from his very first words your attention is aroused—you follow his ideas, warm to his views, listen with a glow of interest and satisfaction. What is it that makes this man's speech so effective, his appearances so popular? You can discover the fundamentals—apply them to your own speaking—with the aid of this new book.



Just Published — William G. Hoffman's  
**PUBLIC SPEAKING TODAY**

355 pages, 6 x 9, \$2.75

Helps you get confidence, develop a livelier style, get a topic, know what to say, dress up the facts, prepare the speech, deliver it, lead a meeting, act as toastmaster, develop a more effective voice, etc., etc.

- 18 chapters full of most immediately practical and useful pointers
- 10 varied actual talks aptly introduced and analyzed to illustrate many points
- Covers all kinds of talks, including radio and roundtable
- 560 suggestive topics for practice talks and speeches
- 159 discussion and practice assignments for public speaking clubs and classes

This practical book cuts through the mass of psychological and technical analyses and refinements that have grown up around the subject of public speaking, and gives a simple, functional approach to the elements of preparing and making a good speech. In short, it is **REALISTIC**—enabling you to see the idea of making a talk or speech in a practical light—and, by following logical steps for the purpose, to make your talk interesting, informative, convincing.

10 DAYS' FREE EXAMINATION  
SEND THIS COUPON.

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. C.

Send me Hoffman-Public Speaking Today for 10 days' examination on approval. In 10 days I will send \$2.75, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address ..... Position .....

City and State ..... Company ..... EC-7-41  
(Books sent on approval in U. S. and Canada only.)

*Better  
Lighting*

[FROM PAGE 72]



**INCREASED ILLUMINATION** to the amount of 25-30 foot-candles eases the difficult seeing tasks in the low bay area of this machine tool plant.

lamp unit with blue-white lamps on 10- by 11-foot centers. The resultant illumination is between 25 and 30 foot-candles.

**EIGHTY FIVE FOOTCANDLES  
IN STORE**

Jewelry store owners have been especially enthusiastic about the use of fluorescent lamps for lighting their displays. Precious stones displayed under these linear sources appear to take on additional size, their color is vivid and



**JEWELS SPARKLE** under eighty-five foot-candles of combination fluorescent and incandescent general lighting in this jewelry store. Show cases have 150 foot-candles.

by means of supplementary light from filament lamps, full sparkle is retained.

An excellent example of combining fluorescent and filament lamps to create an effective selling environment is found in The Pugh Brothers store at Youngstown, Ohio. The main floor area is 15-feet wide and 98-feet long with a 12-foot ceiling. For symmetry's sake, the lines of fluorescent lamps are placed

# PRODUCTION CAPACITY INCREASED 5 WAYS!

**Sensational Advance in Lighting Levels to  
75 FOOTCANDLES or MORE**  
Now obtainable through this New  
**Benjamin Fluorescent Lighting System!**

**NO** plant can possibly attain its maximum productive capacity without the fullest utilization of the higher lighting levels made possible by these latest developments in lighting!

## Capitalize on These Benefits

For only through these higher lighting levels can you secure maximum speed and ease of seeing necessary to increase production and maintain quality. Only when you make these higher levels available to *all employees*, in every part of the plant and for every shift, can you hope to get uniformly high production speed throughout the plant day and night! Only when you have restful, adequate lighting can you keep employee fatigue at a minimum. Only when you have converted to production use all space now being wasted through lack of adequate lighting are you utilizing the full productive capacity of your plant.

Benjamin Fluorescent Lighting enables you to get these higher levels economically with a minimum of installation cost

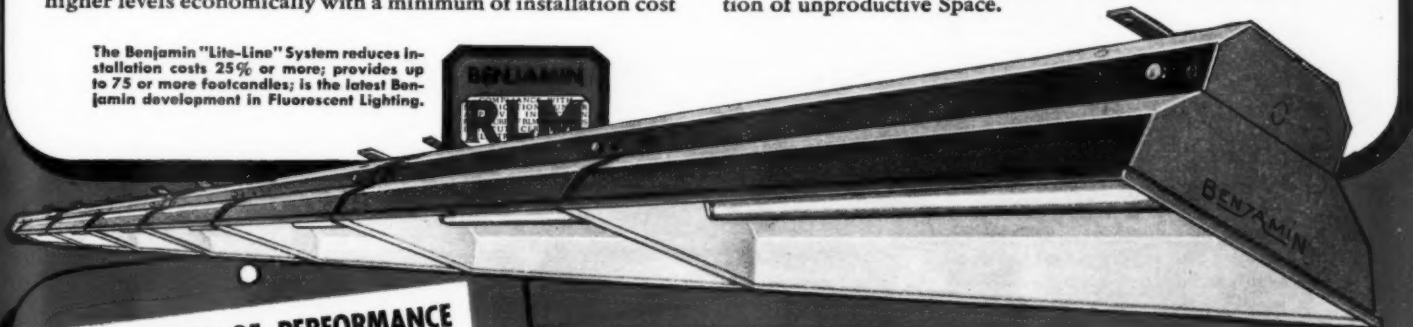
The Benjamin "Lite-Line" System reduces installation costs 25% or more; provides up to 75 or more footcandles; is the latest Benjamin development in Fluorescent Lighting.

and without annoying glare or heat. Thus Benjamin Fluorescent Lighting makes it practical and economical to provide all your employees with 75 footcandles or more of light. An amount which may be as much as

## 5 TIMES MORE LIGHT

than is now being provided employees working away from windows or on night shifts! There is no question that these higher levels will increase the quantity and quality of production. For scientific tests made in the laboratory prove that light acts as a magnifier and thus increases the speed of seeing. Poor eyes are made more efficient and average eyes are made excellent. These and other findings of the science of seeing as well as actual day by day plant experience show that these high levels of light increase productive capacity in five ways:

(1) Equal Efficiency on Every Shift and in every part of the plant; (2) Minimized Employee Fatigue; (3) Greater safety and protection against accidents; (4) Less Rejects; and (5) Utilization of unproductive Space.



## WARRANTY OF PERFORMANCE AND CONSTRUCTION

The Trade Mark

**BENJAMIN**

on Fluorescent lighting equipment is your assurance of correct design, heavy-duty construction and efficient performance backed by forty years of specialization in manufacturing lighting equipment for commerce and industry. Reflectors, auxiliary control equipment, sockets and other component parts of these fixtures are engineered for co-ordinated operation with Mazda Fluorescent Lamps to give maximum light output and trouble-free operation.

Benjamin Fluorescent Lighting Fixtures are warranted to comply with all recognized illumination, electrical and mechanical standards and applicable RLM standard specifications and to comply fully with specifications and performance data published for each type of unit by Benjamin Electric Mfg. Company. They are fully warranted against defects in material and workmanship and are built with an extra safety factor of strength to insure long life and maximum durability.

All auxiliary control equipment is certified by Electrical Testing Laboratories to conform with the latest specifications for such equipment sponsored by the Mazda Lamp Manufacturers. Complete units and all auxiliary control equipment and sockets are listed by Underwriters' Laboratories as meeting National Electrical Code requirements as evidenced by Underwriters' inspection label affixed to each unit.

**BENJAMIN ELECTRIC MFG. CO.**  
Des Plaines, Ill.

Benjamin Fluorescent Lighting Equipment is the Product of 40 Years of Specialization in the Production of Scientifically Designed Industrial Lighting Equipment

Every Benjamin Fluorescent Lighting Unit carries the Benjamin Warranty of Construction and Performance. This Warranty is your assurance of the two essentials of complete satisfaction with Fluorescent Lighting. *Performance* that meets the highest standards established by Benjamin and the RLM Standards Institute and Certified by the Electrical Testing Laboratories; *Durability* that meets Benjamin "built-like-a-Battleship" construction standards for heavy duty service, long life efficiency, lowest operating and maintenance costs.



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FLUORESCENT LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers

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Without obligation, please send Bulletins containing complete data on Benjamin RLM Stream-Flo and Lite-Line Fluorescent Lighting Equipment.

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**Paragon**  
MAKES  
ALL TYPES



No matter how tough your time switch job, Paragon can supply a unit to "lick" it . . . because Paragon makes a dependable, precision time switch for every need.

**300 Series**—Ideal for signs and general time switch applications. Just two exposed gears; all others operate in a sealed oil filled chamber. Only \$13.00 list.

**G Series**—Heavy duty, Synchronous. Designed for extra long, hard service. 40 to 150 Amperes—single, double or three pole—one, two or three circuits. Indoor or outdoor models, with or without Sunday and holiday cutouts.

**700 Series**—Equipped with 7-day self starting synchronous clock movement and 7-day program dial with each day independently adjustable.

Numerous other types available. Send for a complete catalogue.

**PARAGON ELECTRIC CO.**  
401 S. Dearborn Street, Chicago, Ill.

**Paragon**  
BUILDERS OF  
CONTROL INSTRUMENTS  
SINCE 1905 *Chicago*



[FROM PAGE 74]

on either side of the air conditioning ducts which bisect the sales area. The lamps employed are 40-watt white mazda F's and these are placed in three rows in the two shallow recessed troughs. To cut down on the possibility of any discomfort from the end-

wise viewing of the lamps, metal baffles are placed on 2-foot centers and extend three inches below the lamps along the entire trough lengths.

The filament lighting consists of 300-watt lamps behind four Holophane downlighting units. These are incorporated with the fluorescent system and placed directly over the cases in which diamonds are displayed. The high-lights which result give the desired glitter and sparkle to these precious stones. There are approximately 150 foot-candles provided in the cases.

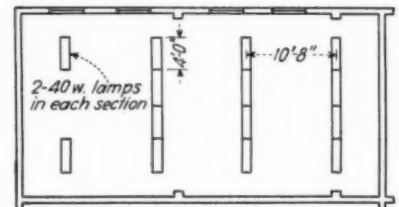
## Lighting a BOOKKEEPING DEPARTMENT

### Fluorescent

**PROBLEM**—To provide adequate illumination of the proper quality to ease the visual tasks of bookkeeping work.

**CONSTRUCTION DATA**—The office is 21-ft. 6-in. by 42-ft. 6-in. with a 10-ft. 4-in. ceiling, windows along one side and light walls and ceiling. Desks are arranged in two rows parallel to the window.

**SOLUTION OF PROBLEM**—Twin lamp direct fluorescent luminaires in four foot sections with parallel louvers are installed across the width of the area end to end and spaced 10 feet 8 inches apart. The units are surface mounted on the ceiling.



LAYOUT PLAN of bookkeeping area showing arrangement and spacing of luminaires.

**RESULTS**—Average illumination after 200 burning hours is 35 foot-candles with "day-light" fluorescent lamps. Light quality mixes well with daylight from adjacent windows.

LOUVERED FLUORESCENT lighting units are installed end to end to provide general lighting in a bottling plant office.



*Fluorescent at its Finest*

by HYGRADE



*— the pioneers*

**OUTSELL YOUR  
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MIRALUMES!**



**Quality-made, completely guaranteed fluorescent lighting fixtures — ready for immediate delivery!**

**N**O other contractor competing on the same job can possibly match your "selling story" . . . when you're selling Hygrade MIRALUMES!

For no other fluorescent lighting fixtures in the world combine all the advantages of MIRALUMES!

**Get a load of this!**

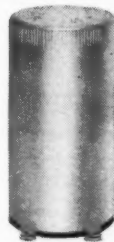
You can offer prospects *finer light*, with MIRALUMES (Hygrade's patented lamp coating) . . . *positive starting and re-starting* (Hygrade's patented Mirastat starters) . . . lower maintenance (Hygrade's easily demountable reflectors and sturdy lamp holders) . . . plus a complete *guarantee* that assures complete satisfaction!

**You're selling quality!**

Fewer complaints and call-backs—more time for more sales—with MIRALUMES. They're quality

manufactured . . . better designed and engineered throughout . . . wired and ready to install, complete with superior-quality Hygrade lamps . . . Underwriter's Laboratory approved . . . high power factor . . . starters easily accessible . . . eligible for FHA financing!

**Write today** for MIRALUME catalogue, prices, discounts. Dep't EC7, Hygrade Sylvania Corp., Ipswich, Mass.



**GET BETTER PERFORMANCE  
WITH THE NEW MIRASTATS!**

Here's the finest fluorescent lamp starter on the market . . . now available to all fluorescent users . . . the new Hygrade Mirastat! Assures positive starting and re-starting—longer lamp life—performance that's *dependable*!

# Hygrade MIRALUMES

**Complete with Superior Hygrade Fluorescent Lamps**

Hygrade Sylvania Corp., Est. 1901. Also Makers of Hygrade Fluorescent and Incandescent Lamps and Sylvania Radio Tubes.

# Questions ON THE Code

Answered by  
**F. N. M. SQUIRES**

Chief Inspector New York Board of Fire Underwriters

## Common Neutrals

**Q.** "Does the N.E.C. (1940) prohibit the use of the common neutral for several branch circuits? Common neutral, paragraph 2133 of 1937 Code has been deleted from 1940 Code, and yet paragraph 2104 (1940) code is covering the multi-wire branch circuits (with common neutral).—B.A.L.

**A.** Provision for the use of a common neutral for branch circuits has been eliminated from the Code making their use no longer permissible. Common neutrals for feeders, however, are still permissible under Section 2205 for two or three sets of 3 wire feeders or two sets of 4 or 5 wire feeders.

But to understand the new prohibition the term "common neutral" must be understood. This means a neutral wire which serves more than one branch circuit, or a neutral which is used commonly to more than one branch circuit, whether the branch circuits are two-wire or multi-wire ones.

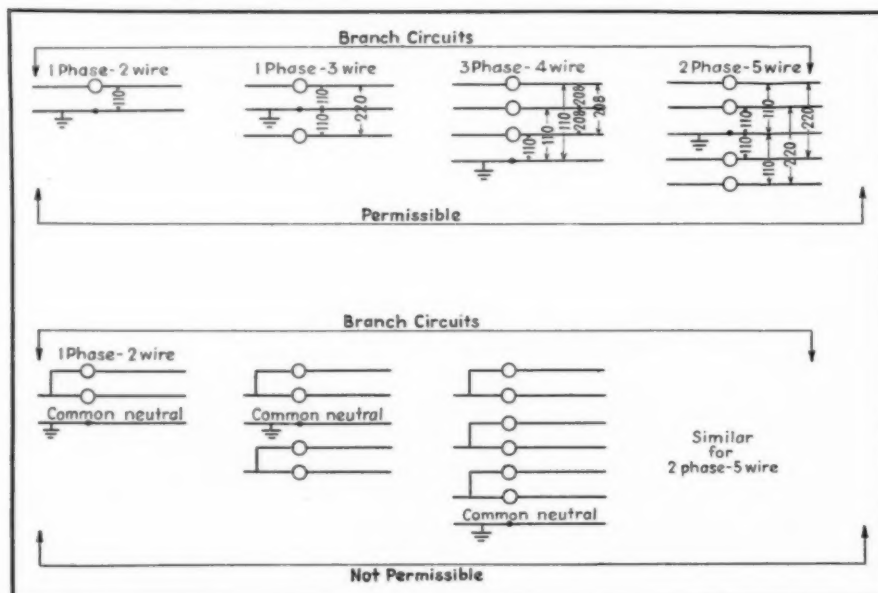
And according to section 2104a, multi-wire branch circuit consists of two or more ungrounded conductors having a difference of potential between them, and an identified grounded conductor having equal potential between it and each ungrounded conductor.

The neutral of a single multi-wire branch circuit is not considered a "common" neutral. It only becomes a "common" neutral when used with two or more branch circuits and it is this use of it which is prohibited. See sketches.

## Types of Wires for Various Uses

**Q.** "Where in the Code does it state what type wire must be used in conduit and electric metallic tubing?"—F.R.B.

**A.** The uses of wires of the various types of insulations are shown in the last column of the table in Section 3005 and in the last column of the table in Section 93001 d.



## Explosion Proof Motor

**Q.** "If the government specifies a Class 2 Group G motor for explosive dust locations, will I comply with the specifications if I substitute a Class I Group D Motor?"—B.A.S.

**A.** The following quotations are taken from the Underwriters' Laboratories' List of Inspected Electrical Equipment in which electric motors for use in hazardous locations are listed.

"Motors for use in Class I hazardous locations are of the explosion-proof type" and are "capable of withstanding internal gas or vapor-air explosions without causing ignition of surrounding flammable or explosive atmospheres."

"Motors for use in Class II hazardous locations are of the dust-tight type, so constructed as to operate at a safe temperature when blanketed with dust."

"Explosion-proof type of motors are not necessarily acceptable for Class II locations as the motors may not be dust-tight or operate at a safe temperature when blanketed with dust."

"Motors which have been found acceptable for both Class I and Class II are so labelled."

Therefore unless the motor is labelled for use in Class II Group G location it should not be used in such an atmosphere.

## Licensing and the N.E.C.

**Q.** "Our City adopted the National Code as a standard of wiring and also provides that all contractors and journeymen be licensed."

"The questions are:—

"Does the N.E.C. provide that the hanging (not wiring to, or connecting) of neon signs be done by an authorized electrician?"

"Does the N.E.C. provide that a person removing and installing tubing on a sign be an authorized electrician?"

"Does the N.E.C. provide that a person removing and installing transformers be an authorized electrician?"—

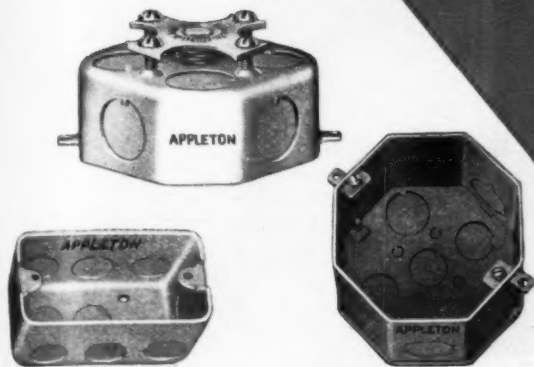
W.L.R.

**A.** The provisions for licensing of electricians and the provisions as to what work may be performed by licensed parties will be found in your City Ordinance. The National Electrical Code does not contain any provision for the licensing of electricians or electrical contractors nor does it attempt to specify what work may or may not be installed by a licensed party. Such matters are not within the province of the

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*the Complete Line*



OUTLET AND SWITCH BOXES



THREADED  
AND NO-THREAD  
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The name "Appleton," the registered trademark, "Unilets," or the famous circle-A Appleton trademark shown above, appears on every Appleton fitting. We manufacture no private brand goods!



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Every job—big or little, residential or industrial, hazardous or non-hazardous—moves faster when all fittings come from *one dependable source.*

That is why alert contractors are standardizing on the COMPLETE Appleton line. It includes every fitting they need, and installation is easier, due to superior Appleton design.

Every Appleton fitting is built to highest quality standards! Light, yet strong; smooth, true in shape, accurate in dimension—they are STANDARD FOR BETTER WIRING!

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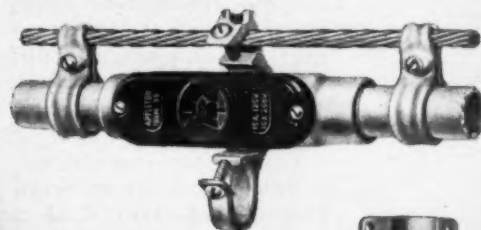
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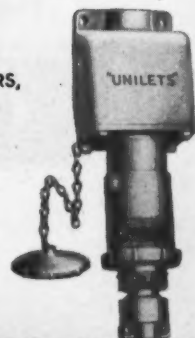
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Appleton types . . .  
blanketing every need*



EXPLOSION-PROOF AND DUST-TIGHT FITTINGS



FIXTURE HANGERS,  
PLUGS AND  
RECEPTACLES



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CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

# G-E WHITE PLASTIC RECEPTACLES



**KEYLESS RECEPTACLES**  
660 Watts 250 Volts  
GE155 for 3 1/4" outlet box  
GE088 for 4" outlet box

**PULL RECEPTACLES**  
250 Watts 250 Volts  
GE3015 for 3 1/4" outlet box,  
7" chain  
GE3016 for 3 1/4" outlet box,  
7" chain and insulator link  
GE3017 for 3 1/4" outlet box,  
short chain and cord  
GE3018 for 4" outlet box,  
7" chain  
GE3019 for 4" outlet box,  
7" chain and insulator link  
GE3020 for 4" outlet box,  
short chain and cord

These good looking receptacles are much lighter in weight than porcelain and are easy to handle. Wiring time is saved because they have more wiring space and wiring is easier. Binding screws accommodate No. 12 wires providing greater wiring flexibility. Breakage is practically nil. The increased base diameter will conceal broken plaster around the box.

The ribbed construction of these receptacles provides lasting strength. The keyless type has knockouts for drainage. All receptacles have shade holder grooves.

For further information see the nearest G-E Merchandise Distributor or write to Section D-187, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL  ELECTRIC**

*Questions  
IN THE  
Code*

[FROM PAGE 78]

National Electrical Code but should be defined by the local ordinance.

But where there is a local license law in effect, it is highly improbable that any electrical work on electric signs is exempted from its provision.

The only work on an electric sign which could or should be exempted is the painting of it.

## Gasoline Service Station

**Q.** 1. "At a retail gasoline Service Station with gasoline pumps on 'islands' outdoors, under a canopy, which extends from a building, canopy open on three sides, is the area under the canopy considered a hazardous location?"—G.F.B.

**A.** 1. No, with the exception of the gasoline pump itself, the area under the canopy is not generally considered as a "hazardous location." This is on the assumption that the three sides under the canopy are open and therefore freely ventilated. As to the gasoline dispensing pump itself, any electrical equipment within the pump enclosure is considered in a hazardous location and must be of the "explosion proof" type unless, as is often the case, the upper part of the enclosure is shut off from the lower part by a tight plate or shield in which case the upper part is not considered a hazardous location.

While the Code does not give any ruling directly about equipment outside of but near the dispensing pump, any switch or attachment plug or other source of sparking should be kept at least six to eight feet away from the pump and preferably about four feet above the ground on account of occasional spillage of gasoline.

**Q.** 2. "Should ceiling fixtures on the canopy of a gas station island comply with Article 500, Section 5050, of the 1940 National Electrical Code?"—G.F.B.

**A.** 2. As such fixtures would not be in a hazardous location, they would not need to be of the explosion proof type.

**Q.** 3. "Would fluorescent fixtures on ceiling of the canopy of a gas station island comply with Code?"—G.F.B.

**A.** 3. If the fluorescent fixtures are listed as of the weatherproof type, they could be used in the canopy.

**What Has R.W. Got  
That Type R Hasn't?**

**Q.** "What kind of insulating material do conductors of the Code type R.W. have that the Underwriters' Laboratories allow it to be used in place of lead covered conductors in conduits in wet locations? What is the difference between Code type R and type R.W. insulation?"—C.L.B.

**A.** While rubber is supposed to be impervious to water or waterproof, it has long been recognized that type R insulation had so little real live rubber in it that it could not stand any prolonged immersion in water. Hence the requirement for a covering of lead to protect the so-called "rubber" insulation where the wires used were subject to prolonged moisture.

As a large percentage of wiring jobs are not subject to moisture and as type R insulation when dry has sufficient dielectric strength this type of insulation was allowed to persist. A better grade would have cost more. But when lead coverings failed to stand up (often through imperfections in the quality of the lead) wire manufacturers looked around for something that would be impervious to moisture without the extra expensive leading operation.

Their chemists found that compounding different and sometimes new materials and sometimes mixing them in a different manner, produced compounds of different molecular structure which made the resulting material impervious to moisture. Some of these processes are trade secrets and therefore not known to this writer.

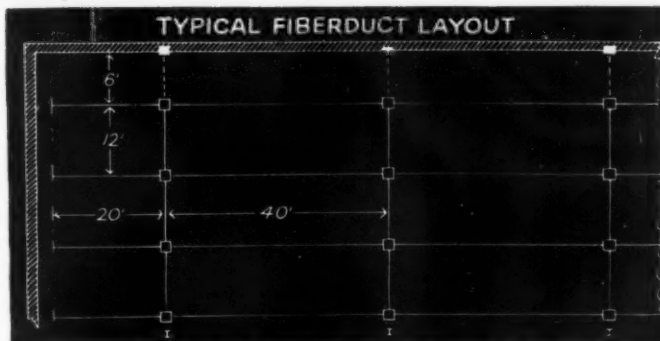


**REVISED CODE** for Kansas City, Mo. electrical work is one of the jobs which A. Penn Denton, Assistant Commissioner of Public Works (left) has undertaken in his new post. As part of a broad revision in all city building codes, preparation of the new electrical code has had the finest cooperation from all branches of the industry, he says. Chief Electrical Inspector G. V. Dameron, (right) is urging several adequacy provisions and power factor rules.

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**FIBERDUCT CAN BE LAID OUT TO SUIT THE NEEDS OF  
A BUILDING. ABOVE IS A TYPICAL FACTORY LAYOUT**

Fiberduct underfloor raceways will make power conveniently available in the buildings you wire. These raceways can be tapped at any time for electrical connections. Your customers are sure to be pleased with the flexibility Fiberduct gives.

Outlets can be preset at the factory or set when the Fiberduct is installed or set at any later time. Ducts can be installed for power, for lighting or for signal systems.

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For further information about Fiberduct and the ways in which it can be installed see the nearest G-E Merchandise Distributor or mail the coupon for a G-E Fiberduct combined catalog and manual.

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Sirs: Please send me the G-E Fiberduct combined catalog and manual.

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# GENERAL ELECTRIC

# In the News

## BUSSMANN FUSE MADE CODE STANDARD

Standards for the type S, tamper-resisting fuse, required by the National Electrical Code after Nov. 1st were adopted at a special meeting of the Electrical Committee, NFPA in Chicago on June 10-11. The dimensions and design of the Bussmann patent were chosen and a contract arranged whereby right to manufacture this type of fuse will be made available without royalties to any manufacturer provided his products are approved by the Underwriters Laboratory.

A proposal for revision of the Code to replace five existing wires with a new type R wire and to permit the use of RU and SN conductors on new work was withdrawn as an "interim proposal" and referred by resolution to a new committee on Article 310. The committee will report to the membership of the Electrical Committee after January 1942. The proposal was originally presented by the National Electrical Contractors Association.

The Electrical Committee also voted to recommend to NFPA approval of the recent simplified practice action of NECA, wire manufacturers, and the Bureau of Standards toward eliminating No. 5, No. 3 and over 500,000 cm. wires from regular stock. In the same action a technical subcommittee was instructed to review the paragraphs of the Code that are affected and to consider a more liberal recognition of conductors in multiple.

The meeting, originally called to consider broad principles of Code procedure and application, made several changes in the procedure for interim amendment. Among those adopted were a closed period between the time Article Committee reports are submitted to the Electrical Committee and the Electrical Committee meeting. During this time interim amendments can not be submitted.

Chapter Three of the National Electrical Code will be rearranged and the articles given a different grouping. Although no change has been made in the substance of the articles, this action will increase the number of technical sub-committees working on this section. Of particular interest here is the new committee on Article 310—"Conductors."

A suggestion for a simplified code to be

used in rural areas and small towns was also discussed without action. Suggestions for special rules concerning fluorescent lighting, defense lighting, temporary wiring and similar special problems were also reviewed.

## BUILDING MANAGERS PRAISE SMALL DIAMETER WIRES

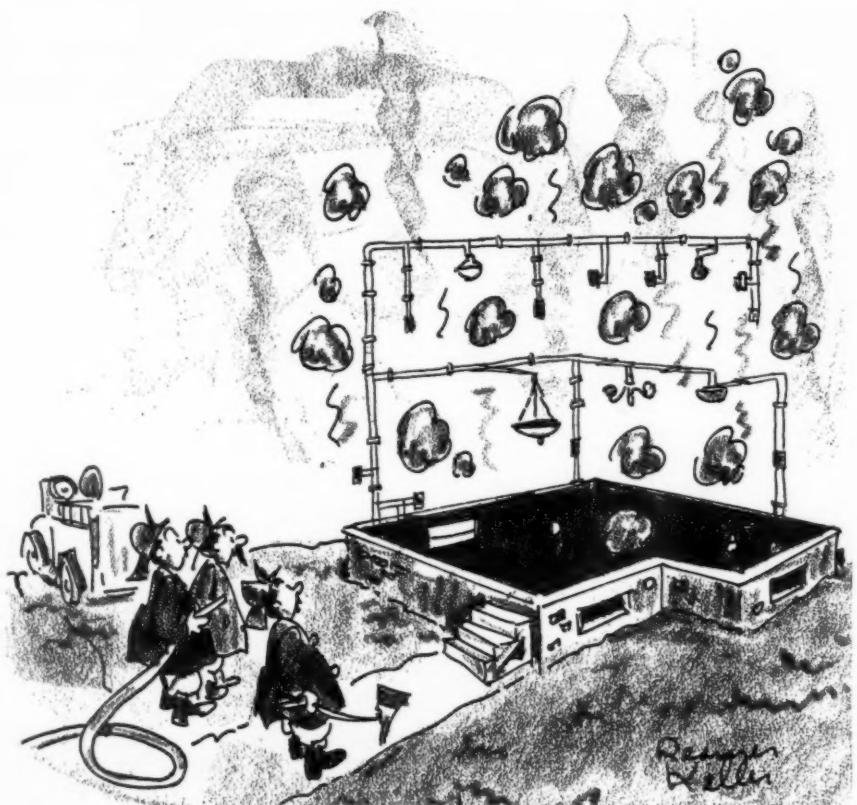
Small diameter wires for rewiring office buildings are making possible sweeping plans for modernizing lighting and electrical facilities, Paul G. Heidman, of Detroit, told the annual convention of the National Association of Building Owners and Managers in Chicago on June 16.

Quoting statistics drawn from statements of building owners in 158 cities, he said that \$75,000,000 will be spent in renovating office and commercial buildings and \$15,000,000 on the improvement of apartment properties this year. The survey indicated, he continued, that 56 percent of the building managers planned to modernize lighting and 32 percent planned to improve electric wiring during 1941. "It is doubtful", he said, "if such sweeping plans for electrical modernization would have been possible but for the advent of thin wall wiring."

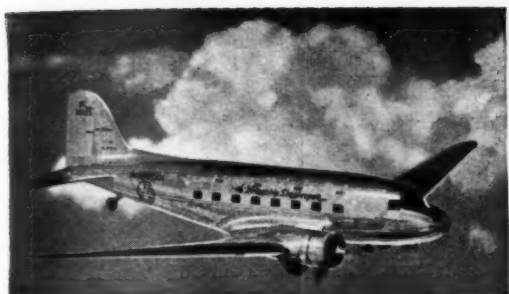
## VIRGINIA CONTRACTORS PLAN PROGRAM

The Virginia Electrical Contractors Association, Inc., believe that the main issue of an organized group is the restoration of contractor friendliness for one another, a building up of faith, trust and co-operation among each other and the fostering of legislation that will best serve the general public and the contractors themselves.

Feeling that a strong state association depends upon strong local organizations, they are going out to organize local groups, little fellows as well as big ones. Working on this premise, they have developed the following program as outlined by Marion W. Scarborough, newly appointed field representative for the state association.



"They must have had a good electrician—only thing left standing is the wiring."



## AMERICAN AIR LINES

GET BETTER LIGHT *Fast-Economically*  
TO SPEED VITAL OPERATIONS



"NERVE CENTER" of great American Air Lines at LaGuardia Field, N.Y. is this busy Reservation Room. For maximum worker efficiency it is lighted with IVANHOE "50 FOOT CANDLER" recessed in the ceiling, providing fine, well-diffused fluorescent lighting.

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FLUORESCENT  
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### TODAY WITH DEFENSE IN THE DRIVER'S SEAT, THIS BETTER FLUORESCENT LIGHTING SYSTEM CAN CONSERVE SKILLED LABOR—WIN YOU MORE JOBS

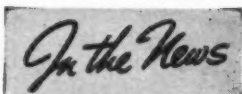
● IVANHOE "50 FOOT CANDLER" went to work for American Air Lines quickly and economically. It can do as much for your customers. This better lighting system is engineered that way. Its built-in wireway contains up to 80 per cent of necessary building wiring. Cuts installation costs from 30 to 50 per cent. Permits people to go right on working while system's going in. Maintenance? A cinch—with conveniently removable reflectors.

These benefits to users are benefits to you as well. For the exclusive features of IVANHOE "50 FOOT CANDLER" (the first RLM *Continuous Wireway Fluorescent Lighting System*) cut you in on jobs at "the planning stage"—enable you to handle more and bigger jobs—conserve the precious time of your skilled labor. For full details write for Bulletin 1C.



THE MILLER COMPANY  
MERIDEN, CONN.

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[FROM PAGE 82]

1. To develop an interest among the leaders in the contracting business toward the need for collective strength in the industry.

2. To instill in the minds of the contractors in the state the need for closer co-operation and cleaner competition to gain the respect of the public.

3. To curb the unorthodox methods of merchandising that have already gripped the contractor-dealer.

4. To co-operate and promote a harmonious relationship with the various branches of the electrical industry.

5. To organize the various types of contractors in their own groups where problems of common interest may be solved.

6. To disseminate and distribute helpful and protective measures affecting the contracting industry.

7. To curb, through effectively and closely-organized groups, the common curse of the unethical and unscrupulous general contractor who goes bid-peddling.

8. To foster legislation that will best serve the general public and aid in curing some of the ills of the contracting industry.

9. To advocate and encourage closer working together, one with the other, in competitive fields.

10. To concentrate on a program of activities that will encourage contractors to become better salesmen and merchandisers.

11. To organize first—strong local groups, as a basis for a strong state association.

12. To realize the above program through the individual co-operation of each member with the association, its officers and representatives.



**HOME DEFENSE** is another problem added to the broad shoulders of Henry Z. Lang, president of Lang Electric Co., electrical contractors of Buffalo, N. Y. As a captain in the 4th Brigade New York Guard, Henry is studying measures for the defense of industrial and civilian areas. And they're working out a mobilization plan that will stand all tests.

## ESTIMATORS OBSERVE 25th YEAR

Seven charter members of the Chicago Electrical Estimators' Association were guests of the club at a meeting on June 16, observing its 25th year.

A. C. MacWilliams, A. R. Locke, George Evans, R. A. Morrison, A. G. Soderberg, George Carlson and John R. Smith, who worked with the organization during its first year, were present. Most are still active members.

The club started in 1916 when three estimators held a post mortem over bids ranging from \$20,000 to \$60,000 on one project. Many of the basic methods of electrical estimating in use throughout the country were developed by this group.

## ELECTRICAL ADVISORY COMMITTEE APPOINTED BY OPM

An electrical industry advisory committee, consisting of 24 members, has been named by the Office of Production Management. The purpose of the committee is to speed cooperation between industry and Government on defense program problems.

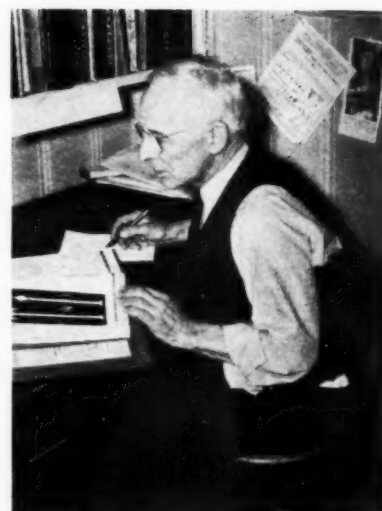
The committee, which will be purely advisory, will function under the direction of Donald G. Clark, chief of the Equipment and Supplies Branch of the Purchasing Division, and Lewis A. Jones, special advisory on electrical supplies.

Problems which have arisen, and which will be considered by the advisory committee, include those of the conservation and substitution of materials, simplified practice, revision of specifications, problems of raw materials supply, allocation of production capacity, inventory control and the like.

From the committee of 24 members six have been designated a steering committee to work with Donald G. Clark. The members are W. J. Donald, managing director, National Electrical Manufacturers Association; Leonard Kebler, president, Ward Leonard Electric Co., Mount Vernon, N. Y.; J. P. Shelley, president, Metropolitan Electric Manufacturing Co., Long Island; W. E. Sprackling, vice-president, Anaconda Wire & Cable Co.; George Thomas, Jr., president, Thomas & Betts Co., Elizabeth, N. J.; George F. Hessler, sales manager, Graybar Electric Co., New York.

The other members of the full committee are:

H. E. Blood, president, Norge Division, Borg-Warner Corp., Detroit; C. L. Colens, president, Reliance Electric & Engineering Co., Cleveland; Frederick Eise-man, secretary-treasurer, Revere Electrical Co., Chicago; Ralph Kelly, vice-president, Westinghouse Electric & Manufacturing Co., New York; Leslie E. Latham, president, E. B. Latham & Co., New York City; F. W. Magin, president, Square D Co., Detroit; Robert W. McChesney, president, National Electrical Contractors Association, Washington; J. W. McNair, electrical engineer, American Standards Association, New York City; Everett Morss, Jr., president, Simplex Wire & Cable Co., Cambridge, Mass.; John M. Newton, presi-



**COMPREHENSIVE KNOWLEDGE** of the electrical construction industry is one basis of the success of Charles M. Davis, president of C. M. Davis & Sons, electrical contractors and engineers of Harrisburg, Pa. "Pop", as he is affectionately known among his associates, was at one time an Underwriters electrical inspector and his thorough knowledge and appreciation of the Code stands him in good stead in his present business. With a staff of four sons as technicians and a fleet of seven trucks he is ready to tackle any job regardless of size.

dent, Oakes Electric Supply Co., Holyoke, Mass.; Matthew Porosky, vice-president, Eagle Signal Corp., Boston; A. C. Prange, supply sales manager, General Electric Supply Corp., Bridgeport, Conn.; C. A. Scott, vice-president, Rome Cable Corp., Rome, N. Y.; E. O. Shreve, vice-president, General Electric Co., Schenectady, N. Y.; D. M. Simmons, vice-president, General Cable Corp., New York; Paul J. Smith, American Society for Testing Materials, Philadelphia; C. E. Swartzbaugh, president, Swartzbaugh Manufacturing Co., Toledo, Ohio; Walter Williamson, vice-president, Westinghouse Electric Supply Co., New York City.

## SALT LAKE CITY DRAFTS ELECTRICAL LAW

Taking the interest of the electrical man and the public to heart, a number of interested individuals and progress minded electrical groups have drafted a local ordinance which will combine reinspection with contractor licensing.

The legislation, which is still in the embryo state, will cover reinspection and four kinds of licenses, namely, contractors, maintenance men, dealers and journeymen.

## A.I.E.A. OFFICERS RE-ELECTED

The annual election of officers of the American Lighting Equipment Association, was held at a meeting of that organization at Hot Springs, Va., on May 20. J. Markel, president Markel Electric

# "X" MARKS THE SPOT

or places where Fiberglas®  
helps increase production

X

**MOTOR BREAKDOWNS** in Kentucky steel plant required weekly rewinding of 25 to 30 units out of 700 total. So, management insulated all 700 motors, from fractional

h.p. to 250 h.p., with Fiberglas. Motors now operate at average 20% over rated capacity. Breakdowns cut drastically to 3 or 4 motors per week.

## Profit by the example of a Kentucky steel mill!

**T**HE wheels of industry are moving faster today than ever before . . . much faster than in 1918.

Loads are increasing. Equipment is exposed longer to tough operating conditions. Breakdowns are multiplying. *New equipment is getting hard to get.*

What are your plans for meeting this situation? Why not profit by the example of the Kentucky steel mill mentioned above?

By having your present equipment rewound with Fiberglas Electrical Insulation, you get several benefits.

**First**, you may find that your present equipment can withstand excessive loads for abnormal periods of time without insulation failure. This

is because Fiberglas has a longer life under high temperatures than asbestos and a considerably greater margin of safety than cotton.

**Second**, by slight redesign of your present motor, and generator wiring, you may actually increase their horsepower output. This possibility comes from the fact that Fiberglas Electrical Insulation will stand up under operating conditions where cotton or asbestos breaks down.

**What's more**, rewinding old equipment with Fiberglas often solves the problem of a possible long wait for new equipment—which may be very difficult to get in these times. If you can get new motors or generators promptly, your manufacturer

can supply them with Fiberglas insulation, *on your order.*

So, why take a chance in these days when continuous production is so important? Consult your electrical repair shop. Specify Fiberglas Electrical Insulation. Write for additional information to *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

•T. M. Reg. U.S. Pat. Off.

**OWENS-CORNING**

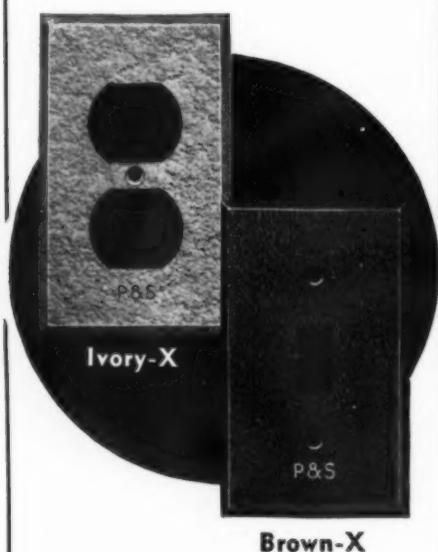
**FIBERGLAS**

# P&S

## WIRING DEVICES

**COOPERATE WITH  
THE  
DEFENSE PROGRAM**

**Substitute P&S  
New Process Plates  
for Brass Plates**



Good looking—with all the  
sturdiness of brass plates.

A COMPLETE LINE

**Sold Through  
Electrical Wholesalers  
Catalog on Request**

**Pass & Seymour, Inc.**  
SYRACUSE, N. Y.

## In the News

[FROM PAGE 84]

Products, Inc., Buffalo, was re-elected president of the association and chairman of its Board of Governors. J. W. Milford, head of J. W. Milford & Associates, promotion and public relations counsel to the A.L.E.A., was elected to the office of secretary-treasurer.

Other officials re-elected to the Board of Governors were: J. H. Blitzer, The Lightolier Co., New York; G. E. Glatthar, Art Metal Co., Cleveland; Max Held, Halcolit Co., Brooklyn, N. Y.; and W. G. Sawyer, John C. Virden Co., Cleveland.

President Markel announced that effective June 2, the general activities of the Association will be centered in the offices of J. W. Milford & Associates, R.K.O. Building, Rockefeller Center, New York City. The Association management was previously handled by Stevenson, Jordan & Harrison.

## COMING MEETINGS

**New York State Association of Electrical Contractors & Dealers**—Saranac Inn, Saranac N. Y., July 7-10.

**International Association of Electrical Inspectors**—Southwestern Section, Hotel De Anaz, San Jose, Calif., August 25-27. Northwestern Section, Winthrop Hotel, Tacoma, Wash., Sept. 2-5. Western Section, Hotel St. Paul, St. Paul, Minn., Sept. 8-10. Eastern Section, Mayflower Hotel, Washington, D. C., Sept. 22-24. Southern Section, McAllister Hotel, Miami, Fla., Sept. 29-Oct. 1.

**National Electrical Contractors Association**—Annual Convention, Rice Hotel, Houston, Texas, Oct. 6-8.

**National Electrical Wholesalers Assn.**—Semi-Annual Convention, Hotel Statler, Detroit, Mich., Oct. 14-17.

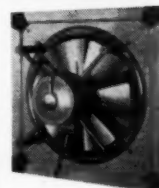
**National Electrical Manufacturers Association**—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27-31.



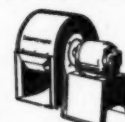
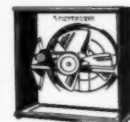
**SHOP ON WHEELS** is what C. C. Buford of Sacramento calls his new and fully equipped truck for service work and installation. That old gag about having to go back for his tools can never be applied to him, for his truck contains all necessary tools, supplies and fittings to do the residential and commercial wiring on which he specializes. Nice appearance of the truck adds prestige to his service, builds public confidence

# Sturtevant

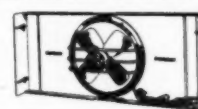
## Puts Air to Work



**Sturtevant Design 7  
Propeller Fan**  
Made in sizes 12" to 45"  
inclusive  
Capacities  
—680 to 15,450 c. f. m.  
Direct connected motors  
A V. Propeller Fans also  
available with belt drive



Atticvane Fan Pressure Blower Ventilating Set



Wind-O-Vane Fan Wallvane Fan

**STOCKS CARRIED AT MANY POINTS**

**B. F. STURTEVANT COMPANY**  
Hyde Park, Boston, Mass. Branches in 40 cities

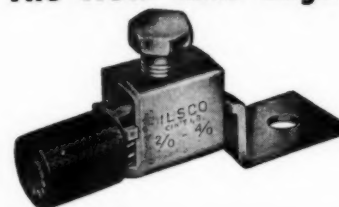
**DISTRIBUTOR FOR SOUTHEAST:**

**NOLAND COMPANY, INC.**  
Virginia South Carolina District of Columbia  
North Carolina Maryland Georgia Alabama

# ILSCO

## SOLDERLESS CONNECTORS

**HAVE YOU TRIED  
The New IlSCO Lugs?**



**BUILT FOR OVERLOADS!**

The new design—as passed  
by the Underwriters' Laboratories May 1, 1940.

GENTLEMEN

Send me New Catalog and Sample

Name .....

Firm .....

Address .....

City & State .....

**MAIL  
COUPON  
TODAY**

**ILSCO COPPER TUBE  
AND PRODUCTS, INC.**

5629 MADISON ROAD ——— CIN., O.



**THOMAS EDISON CLUB** group visited the Detroit Industrial Electrical Show recently. From left to right, P. Brown, Geo. Pirdle, E. A. Pearson, Frank Bailey and C. H. Turner; all electrical contractors from the metropolitan area of the motor city.

### PARKER HEADS BUFFALO CHAMBER OF COMMERCE

Karr Parker, president of Buffalo Electric Company, one of the largest electrical contracting and engineering firms in western New York State, was recently elected president of the Buffalo Chamber of Commerce. The election took place at an organization meeting of the Board of Directors of that group.

### VANCOUVER ELECTRIC CLUB OFFICERS

B. Markham, Northern Electric Co., was recently elected president of the Vancouver Electric Club, Vancouver, B. C. Mr. Markham had served as secretary-treasurer and in other executive capacities in that organization in the past.

Howard Walters, B. C. Electric Railway Co., was elected vice-president; F. Lightfoot, Northern Electric, treasurer and A. J. Napier, Neon Products, secretary.

The following were elected as Directors of the club: T. Clarke, Northern Electric Co.; T. H. Crosby, Canadian Westinghouse Co.; H. S. Dawson, B. C. Electric; W. D. Robertson, Canadian General Electric Co.; G. H. Miller, manufacturers representative; W. G. Metcalf, F. Darling & Co., Ltd.; F. Fatkin, Royal Cleaner Co. and G. Dickie, B. C. Electric Railway Company.

### DEFENSE INSPECTION

Executives of industrial plants in the vicinity of Huntington Park, Calif., the industrial region of Los Angeles county, have been addressed by means of a letter urging them, especially in defense manufacturing plants, to be sure that their electrical equipment is properly installed and maintained. W. J. Treeway, city electrician of Huntington Park wrote the letter. He quoted the resolution passed

# New CATALOG OF GREENLEE TOOLS

**GREENLEE Tools**  
for the  
ELECTRICIAN  
CARPENTER  
PLUMBER  
NO. 33E

**HYDRAULIC CONDUIT BENDERS**

**TUBE BENDERS**

**KNOCKOUT TOOLS**

**CABLE PULLERS**

**PUSH DRILLS**

**BORING TOOLS**

**SPIRAL SCREW DRIVERS**

**HYDRAULIC PIPE PUSHERS**

For the  
**ELECTRICIAN  
CARPENTER  
PLUMBER**

Here's the new 1941 Greenlee Catalog 33-E that every user of tools in construction and maintenance work should have. This handy buying guide has been compiled to make it easy to select the right tools for the job . . . tools designed to make it easier and faster for the man on the job. Send the coupon today for your free copy of this valuable reference of Greenlee Hand Tools for the electrical worker, carpenter, and plumber. You'll learn how these tools can help make your job easier.

● SEND ME THE NEW GREENLEE CATALOG 33E

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

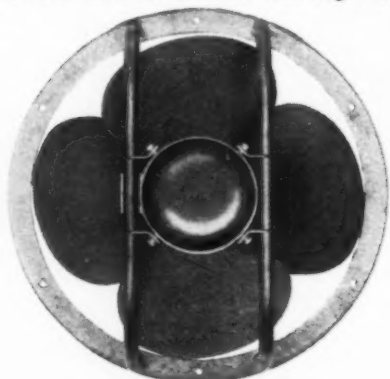
MY JOBBER IS \_\_\_\_\_

**GREENLEE TOOL CO.**

1706 COLUMBIA AVENUE • ROCKFORD, ILLINOIS

# BLOW NEW PROFITS YOUR WAY WITH PEERLESS EXHAUST & VENTILATOR FANS

STORES, churches, schools, restaurants, factories—hundreds of establishments offer you a profitable market for these Peerless Exhaust and Ventilating Fans.



**DeLuxe Exhaust Fans**

Extremely quiet, variable speed fans with specially designed capacitor motors and perfectly balanced, extra wide blades. Either single-speed, two-speed, or three-speed operation.



**Multi-Blade Fans**

Single, two or three speeds

Exclusive Peerless design that moves a large volume of air efficiently. Rust-resisting blades driven by silent, totally enclosed capacitor motor. Ball-bearing thrust bearing permits horizontal or vertical mounting of fan.

*Small Ventilating Fans*, 10-inch six blade fans and 12-inch and 16-inch four blade fans designed for installation in homes, tea rooms, small grills, etc., where larger fans are not required. Quietly operating motors that produce no radio interference.

Send for the Peerless Fan Bulletin SDA-90 and get complete details of sizes and capacities of Peerless Exhaust Fans.

**THE Peerless ELECTRIC CO.**  
WARREN, OHIO

*In the News*

[FROM PAGE 87]

by the inspectors' association offering aid in national defense. He urged frequent reinspection not only to check proper installation but to watch operating conditions and to check against potential sabotage. It is an idea contractors might employ themselves in advertising their services to industrial customers.



*STATE SECRETARY and treasurer of the Rhode Island Electrical Contractors Association, C. J. Longo, is also president of Liberty Electric Co., Providence. While relaxing from association affairs, he finds time to snare a few nice housing jobs.*

## Spokesman

Clyde L. Chamblin, San Francisco electrical contractor and past president of NECA was spokesman for contractors on the program of the Pacific Coast Electrical Assn. annual convention at Coronado, Calif., May 21. Another contractor, K. M. Ryals, Stone-Ryals Electric Co. of San Francisco, a member of the directorate of PCEA, presided over the May 23 general session.

— WITH THE —  
*Manufacturers*

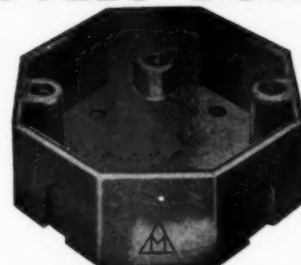
## Westinghouse Appointments

New appointments at the Westinghouse Electric and Manufacturing Co. coordinate the engineering and research departments.

C. A. Powel was named manager of the headquarters engineering department and H. W. Tenney was appointed assistant director of research, two newly created positions. Mr. Tenney will report to Dr. L. W. Chubb, director of research.

A. C. Monteith, manager of the indus-

## Profit by USING ILLINOIS Dependable Porcelain OUTLET BOXES



★ Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

**ILLINOIS ELECTRIC PORCELAIN CO.**  
MACOMB, ILL.

## MULTI



IDEALITE



FLUORAINE

## Fluorescent REFLECTORS . .



FLUORITE

MULTI Fluorescents have construction features that set them apart—high lighting efficiency over long periods—proper types for general or localized lighting—low first cost—easy to clean, install, and service. They give you well-paying installation opportunities.

Send for Complete Catalog

**MULTI**  
**ELECTRICAL MANUFACTURING CO.**  
1840 W. 14th ST., CHICAGO, ILL.

try engineering department, succeeds Mr. Powel.

C. F. Wagner, manager of the central station engineering department, succeeds Mr. Monteith.

R. E. Hellmund as chief engineer, with his staff, will continue to head a consulting service to all engineering groups.

Thomas Spooner, formerly manager of the Research Laboratories, was named manager of the engineering laboratories and standards department.

**Sangamo Electric Company**, Springfield, Ill., at the June meeting of the board of directors, elected Charles R. Horrell vice-president and general sales manager. Mr. Horrell has been sales manager since 1918 when he joined Sangamo.

**Cutler-Hammer, Inc.**, Milwaukee, has transferred R. D. Yoder from the Milwaukee headquarters to the Cincinnati office.

**Fostoria Pressed Steel Corporation**, Fostoria, Ohio, announces the appointment of E. L. Bates as director of sales. Mr. Bates has been vice-president and a member of the board of directors for several years.

**Day-Brite Lighting, Inc.**, St. Louis, Mo., announces the appointment of Richard D. Bradley as director of sales and engineering. Mr. Bradley was formerly a Westinghouse lighting division field engineer at Detroit.

**The Weston Electrical Instrument Corporation**, Newark, N. J., announces the appointment of Edward S. Sievers as a representative. He will be located at 567 Subway Terminal Bldg., 417 So. Hill St., Los Angeles, Calif. John D. Farneman will be associated with Mr. Sievers in this territory.

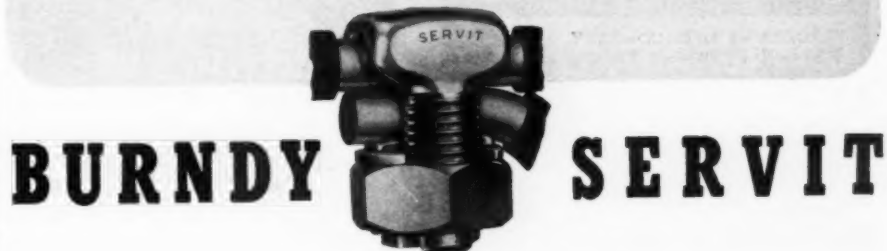
**Chicago Pneumatic Tool Company** announces the appointment of Myron Powers as manager of purchases with headquarters at the general offices, 6 East 44th St., New York. Mr. Powers was formerly in charge of purchases at the Cleveland plant.

Cheer up,  
Contractor!  
Let the  
**BURNDY  
SERVIT**  
help lower  
your costs



High costs fly out the window, when the Burndy Servit comes in your door. The Servit's designed to be installed in a jiffy — so down go your labor costs. And what's more, Burndy's extensive network of distributors means you can now have Servits at moment's notice whenever you need them, whether you're in New York or Kalamazoo. You'll like the time-saving qualities of the Servit, your customer will like its dependable, lasting performance — so don't hesitate. Start lowering your costs with the Burndy Servit, today... Your nearby wholesaler carries Burndy Connectors.

**BURNDY ENGINEERING CO., INC. • 459 E. 133rd ST. • N.Y.C.**



# YOU GET ALL THREE with a BLACKHAWK Pipe Bender



Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that can be used separately from the bending attachments. Here is the triple utility:

## 1 PIPE BENDING

Smooth, remotely controlled hydraulic power bends rigid conduit and pipe up to 4" diameter. Saves need for elbows and couplings and otherwise necessary cutting and threading.

## 2 MAINTENANCE AND PRODUCTION

Big range of attachments adapt the hydraulic unit to push, pull, bend, press, spread and clamp work. Pull gears and pulleys, lift machinery, (as shown at left)—do scores of other jobs allied to pipe bending.



## 3 SPECIAL JACK

Compact 10 or 20-ton ram (same as used in pipe bending) works in all directions — and at any angle. Preferred to all other types of jacks.

### MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY  
Dept. P2071, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

*In the News*

[FROM PAGE 89]

Holophane Company, Inc., New York, has appointed Thomas W. Rolph as vice-president of the company. Mr. Rolph has been associated with Holophane for many years and during much of this time he has been located in Newark, Ohio.

Edison Storage Battery Division, Thomas A. Edison, Inc., West Orange, N. J., has named Alva E. Radcliffe as Cleveland district manager. He fills the vacancy caused by the death of Peter R. Nelson.

Johns-Manville Corporation, New York, has named Dr. C. F. Rassweiler as director of research. He has been director of the Philadelphia laboratory of E. I. duPont de Nemours Co.

The Paragon Electric Company, Chicago, has moved its manufacturing facilities from Manitowoc to Two Rivers, Wisconsin.

Copperweld Steel Company, Warren, Ohio, has appointed Norman L. Deuble as manager of sales. He was formerly assistant to vice-president.

The Condi-Lite Corporation, New York, has moved its offices, laboratory, engineering department and showroom from 43 East 20th Street to 889 Broadway.



NEW RECRUIT in the motor repair industry is Roland R. Brouillette, president of the Pawtucket Electric and Supply Co., Pawtucket, R. I. He combines his motor repair activity with a profitable electrical contracting business.

# ANY DOMESTIC REFRIGERATOR Can Be Made AUTOMATICALLY DEFROSTING

## with the ADJUSTABLE "AUTOMATIC"

MODEL 110

"Plug-In" Type—No Installation  
TIME SWITCH

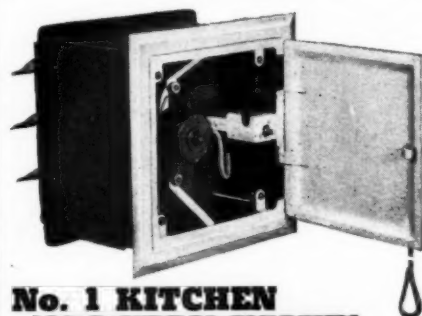
LISTING AT

Only \$11.50

Cuts Refrigeration Costs  
Improves Refrigeration  
Efficiency

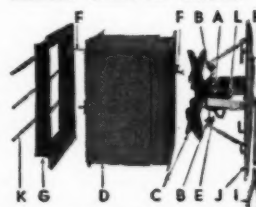
Write for Information

**AUTOMATIC**  
Electric Manufacturing Co.  
MANKATO • MINNESOTA



## No. 1 KITCHEN VENT FAN VALUE!

With the new automatic lever-operated shutters, and other important features, this Signal Kitchen Wall Box Vent Fan, for permanent installation, to fit walls 6" to 24" is today's No. 1 Kitchen Vent Fan value. \$21.50 list price for walls 6" to 11½". Can be installed in new or old homes. Send for details.



It has these important features: A—totally enclosed motor. B—rubber motor mounting. C—10" quiet type fan. D—Telescopic adjustment for walls. E—detachable plug. F—automatic lever-operated shutters. G—cast

iron outside frame. H—inside door for weather protection. I—opening and closing door operates motor and shutters. J—white baked enamel finish. K—close fitting shutters. L—large wool-packed oil reservoirs.

**SIGNAL ELECTRIC MFG. CO.**  
MENOMINEE, MICHIGAN  
Offices in all principal cities

**SIGNAL**

## More Gossip

### All Night Service

A telephone bell blasting away at 3 A.M. is nothing in the busy life of Leo H. Beaulac, president of the Eastern Electric Engineering Co., Pawtucket, R. I. For his company offers a 24-hour maintenance service to industrials in his territory.

Now maintenance is 95 per cent of his business and he keeps the wheels turning in 70 per cent of the mills around Pawtucket. Service pays dividends.



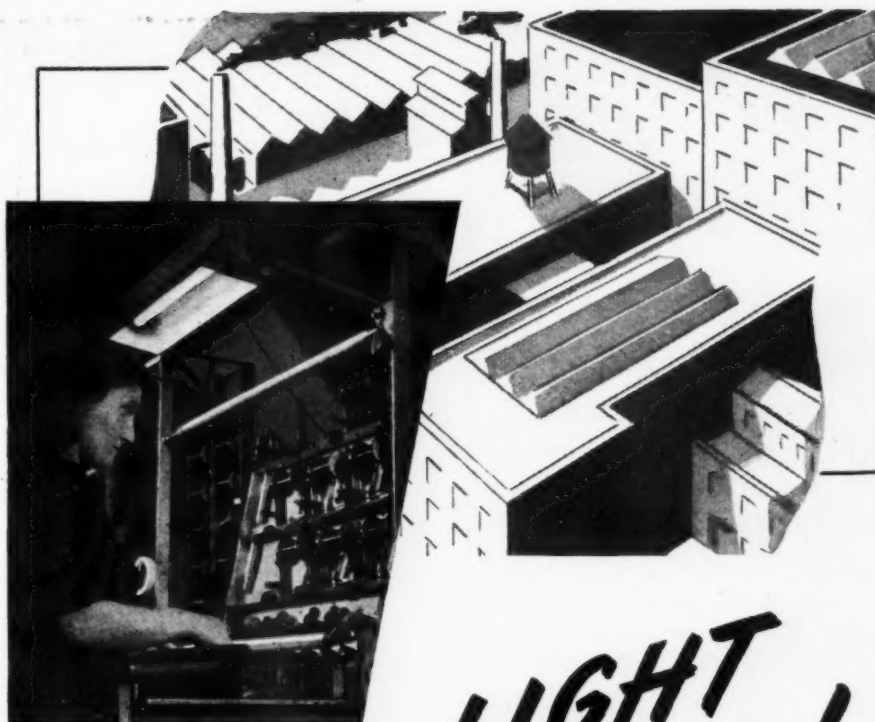
**CONSTRUCTION WORK** is the specialty of Henry J. Dorr, president, Central Armature Works, Washington, D. C. He is in charge of his firm's electrical construction business and has done everything from small jobs to complete radio stations.

### Timely Recognition

"American Machinist", says "One medium sized machine tool plant has neatly solved its problem of installing electrical equipment in the machines it manufactures. To avoid fluctuating payroll and to save expensive investment in special equipment, this manufacturer has retained the services of one of the local electrical contractors. The contractor comes when required and furnishes enough man power and equipment to meet any situation. Not only does the manufacturer save on overhead and eliminate production problems, but he also gets good electrical work on his products."

"This arrangement seems to offer some advantages for other smaller or medium sized plants with no outlay of capital. The contractor, being familiar with electrical code requirements, provides safe and adequate wiring. Electrical work is done neatly and is properly grounded and protected. The contractor's wide experience makes it possible to adopt the best equipment for the job at hand and gives a good installation at a reasonable cost."

*American Machinist* is read by the machine tool industry.

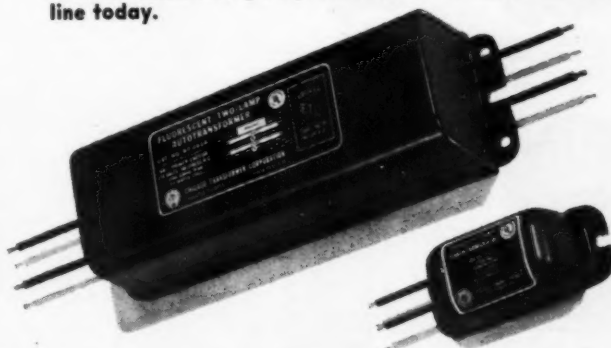


*Where LIGHT must be right!*

### SPECIFY FLUORESCENT LAMP BALLASTS BY CHICAGO TRANSFORMER

Never before has the right light been so important for a right job.

With American industry geared to a staggering production pace, there's no time for lighting failures to disrupt schedules—for faulty lighting to endanger accuracy and safety. That's why Ballasts by Chicago Transformer are used in more industrial Fluorescent installations every month. For Chicago Transformer Ballasts mean dependability where light counts most—Dependability assured by laboratory tests for heat tolerances, Watt delivery control, hum requirements, and wave shape tolerances and long lamp life. Write for new bulletin FBB-0430, giving full details on the entire Chicago line today.



**CHICAGO TRANSFORMER CORPORATION**  
3505 WEST ADDISON STREET • CHICAGO

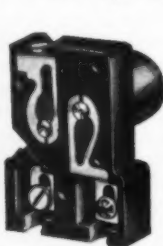
## The Proof of the Pudding is In the Eating

If he didn't like it he wouldn't eat it. And, if electrical contractors and dealers the country over didn't approve of Lloyd Lamp-holders, Starters and Starter Sockets, the orders wouldn't keep rolling in, in always increasing numbers. They prove that

### LLOYD LEADS Here's What One Customer Says

"We can honestly say that we believe the Lloyd Starters, the Lloyd Starter Sockets and Lloyd Lamp-holders are the best on the market in design, quality and performance—and that Lloyd ability and willingness to serve are unexcelled."

*This is but one of the many letters in our files commending Lloyd products. Send trial order or ask for latest Lloyd bulletin.*



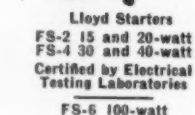
Cat. 252 — Starter Socket with "Lobster Claw" dual spring lock. Pat. Pend.



Cat. 251 — Lamp Holder, black. Cat. 251-W, white. Pat. Pend.



Cat. 352—Separate Starter Socket for remote mounting. Has "Lobster Claw" dual spring lock. Pat. Pend.



Lloyd Starters  
FS-2 15 and 20-watt  
FS-4 30 and 40-watt  
Certified by Electrical  
Testing Laboratories



FS-6 100-watt



All Lloyd Products are Listed and Approved by Underwriters' Laboratories, Inc.

**LLOYD PRODUCTS CO.**

Providence, Rhode Island  
Representatives in 22 Leading Cities

## More Gossip

### More Inspectors

Four more men were added to the staff of the Detroit electrical inspection department in April. The expanded staff was not required, however, for booming industrial construction in national defense factories, Chief Inspector James Galbraith tells us, but because of a huge increase in residential construction.

Chief Galbraith was slated for retirement in June of this year but with the increased load on the electrical inspection facilities of America's greatest mass production center, he has been asked to head the department for another two years.

### Sunlight Daily

W. S. McCarter of Cates and Shepard, Philadelphia has done a fancy lighting job for the Evening Bulletin, the largest home town paper. In the executive office, they built double windows with fluorescent lamps between, hidden at the top by frosted glass. Now the sun shines every day.

### Army Work

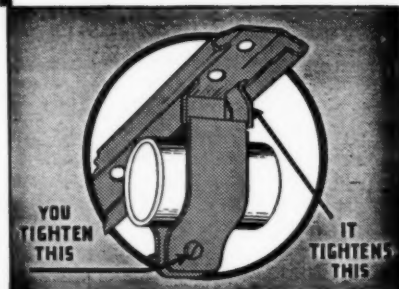
Harry Evans, Evans Electrical Construction Co., Inc., of Kansas City, Mo., was spending a lot of his time at Fort Riley. No, he wasn't in the Army—just doing a large electrical job there. Fortunately, Harry didn't have to obey reveille.



**SUCCESSFUL COMBINATION** of Frank Stark (right) and his son Charles H. Stark, head the Stark Electric Company, electrical contractors and engineers and motor repair specialists of Baltimore, Md. In addition to being sales engineer of this company which specializes in marine and industrial work, Charles is also the new vice-president of the Electrical Contractors Association of Maryland Inc.

With Only One Screw  
to Tighten . . .

## THE CLEVELAND CONDUIT HANGER



Gives You a Quicker  
Easier Installation

"CONVINCE YOURSELF"

"Send for Circular  
Giving Full Details"

**THE CLEVELAND SWITCHBOARD CO.**  
2927 E. 79 St. Cleveland, Ohio



**A SIZE  
and TYPE  
for every  
need!**

## SWIVEL U-BOLT CONNECTOR No Removable Parts



Catalog Nos. 14 to 40

CLAMP and LOCK your CONNECTIONS. This U-Bolt Connector is designed to do just that.

**DELIVERY FROM STOCK**

For complete description—Write for  
**BULLETIN 10-A**

**KRUEGER  
and  
HUDEPOHL**

332-8 Vine St.  
CINCINNATI,  
OHIO



Electrical Contracting, July 1941



**MODERN LIGHTING PAYS** according to W. N. Swartz, building superintendent, Gimbels Department Store, Pittsburgh, Pa. He recently supervised the installation of fluorescent units for general and show case lighting on several floors of their store. And plans are in the hopper for eventually relighting the entire store.

#### Fourth Year Apprentices Out

In Detroit, according to Sam Stovel, the federal apprenticeship field man, fourth year electrician apprentices are being put out temporarily as journeymen to fill the rapidly growing needs of the industry. When emergency needs slow down the apprentices will be required to complete their schooling.

Under Detroit's excellent apprentice program, these boys with three years training behind them are already good mechanics. That three years of carefully planned experience coordinated with intensive school work is easily equivalent to six years of casual "helping" without plan or objective.

#### New Shop Addition

The Warwood Armature Repair Company, Warwood, W. Va., has recently completed a shiny new addition to its motor repair shop. Housed therein is a new small motor repair department, designed to take care of all types of fractional horsepower repair work. In addition to selling and servicing Delco motors in the vicinity of Wheeling, this shop is now able to repair profitably the numerous small armatures for electric drills which are rapidly replacing air drills in the coal mines of the vicinity.

#### Champ Bowlers

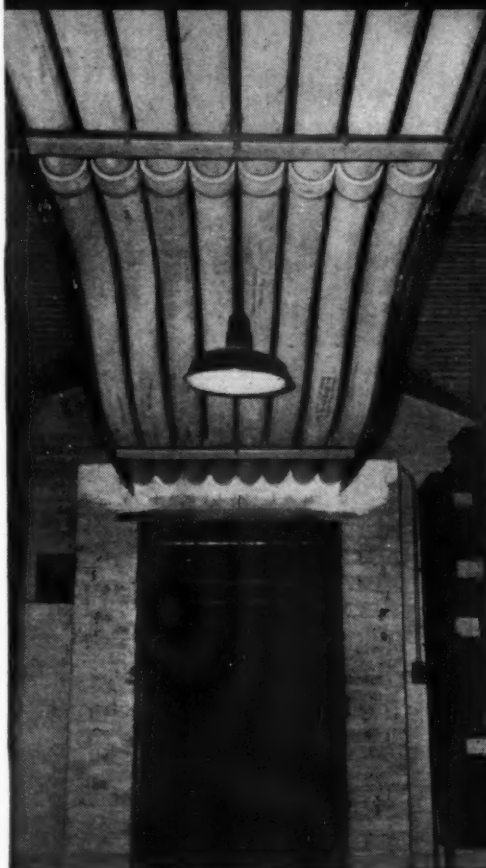
Hohman & Hill, Chicago motor shop, walked off with the Chicago Electric Motor Dealers bowling league, championship for the second year, finishing the season with an eight game lead over their nearest opponent.

But Hohman & Hill have two teams in the league. Team No. 2 wound up in the cellar with exactly reversed figures in the won and lost columns; team 1, 62 won to 31 lost, team 2, 31 won to 62 lost.

## FINISH CONDUIT JOBS

**FASTER** - use J-M

## TRANSITE DUCTS



**TRANSITE CONDUIT** in New York State Capitol Building, Albany, N. Y. Shown here supported by a continuous angle iron framework, they carry the twenty-four 500,000-cm. and eight No. 4/0 lead-covered cables to the main switchboard in the building. *Electrical Contractor: Vanderlinde Electric Corporation, Rochester, N. Y.*

**You** can't miss saving time and money with J-M Transite Ducts. These durable ducts are so light in weight that handling is simple and easy. Crews can assemble Transite Ducts faster, for Harrington Couplings eliminate screwing or threading operations. Joints go together quickly... drive up tight. Transite's smooth bore provides fast, easy cable pulls.

And no preservative treatments are needed, because Transite Ducts are made of asbestos and cement. They can't burn or rot... effectively resist weather and corrosion... end condensation troubles.

**For complete information**, ask for brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N. Y.



## Johns-Manville TRANSITE DUCTS

**TRANSITE CONDUIT**... for exposed work and for installation underground without concrete encasement.

**TRANSITE KORDUCT**... for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.

# BEWILDERED

# ????



by the mass of  
**LIGHTING**  
**EQUIPMENT**  
available?

Here's a boiled-down outline of the contents of Lighting Insert—October Issue:

1. *Fluorescent Industrial Units*
  - a. A definition of classification basis.
  - b. A description of fluorescent industrial units available.
  - c. Each type-group illustrated by a neutral drawing.
  - d. Each type-group describing purpose, scope and proper use.
  - e. Each type-group reduced to a tabulation showing foot candles produced at various mounting heights, spacing and positioning of units recommended for typical conditions.
2. *Incandescent Industrial Units*  
A similar treatment of a number of type-groups.
3. *Fluorescent Commercial Units*  
A similar treatment of a number of type-groups.
4. *Incandescent Commercial Units*  
A similar treatment of a number of type-groups.
5. *Home Lighting Units*  
A discussion of the presentation of incandescent and fluorescent light in the house, with comment on the coming market for fluorescent units in the kitchen and bathroom, for built-in fluorescent lighting for decoration in living, dining and bed rooms, and the possibilities for the sale of certified fixtures to provide more efficient illumination.
6. *Outdoor and Protective Lighting*
7. *Manufacturers' Advertising*

● We don't blame you! It is a puzzling job, deciding whether it should be fluorescent—incandescent—or a combination of both, maybe—

And how about the type and size of lamp?—reflector? Install them high? How close? How many?

If you're like most of us, you use the "I-guess-this-will-do" method.

AND SO you'll probably be interested in learning that Electrical Contracting's editors are going to simplify the whole job . . . so that with one quick reference you know the class of equipment to use, the right type, and the correct method of installation. Then you've narrowed the job down to one of *brand selection*.

All this data will be in the form of a

**LIGHTING INSERT**  
in  
**OCTOBER**  
**ELECTRICAL CONTRACTING**

Start peeling your eye now for this important issue!

## More Gossip

### High Bay Fluorecents

Hall Electric Company of Muskegon, Mich. recently installed a group of fluorescent lighting units in a foundry. The mounting height was much higher than usual industrial lighting practice but, they say, effective illumination at the working level was well up to the calculated intensity. Close spacing over a large area with good reflectors did the trick.



**AVIATION ENTHUSIAST** A. L. Davis, president of A. L. Davis Company, electrical contractors and engineers of Newark, N. J., carries his interest in aviation into inventive channels. Art, who pilots his own ship, has done a bit of research and experimenting on ice formation during flight. The result is that he now has a patent pending on a de-icing compound for airplanes. And the Army seems interested.

### Vancouver Tightens Code

Amateur wiremen and jacks-of-all-trades will find "pickins" pretty tough in Vancouver, B. C., now that the new city electrical code is in effect. The code requires the wiring in basements of all new homes to be in rigid conduits or armored cable and is designed to eliminate haphazard additions of circuits in the future. Contractors are already reaping the benefits.

### Less Mica

Shortage in some strategic defense materials, notably mica, may bring some substitutes into motor repair work, says C. A. Sievert of Sievert Electric Company in Chicago. He is already surveying material stocks and shop methods with an eye to solving shortage problems before they become acute.

There is just a chance that out of the need of the moment better materials and methods will rise up and become permanent additions to the craft.

## Rough Going

Danbury contractors are up against a tough competition for all small work. An active trade school in this celebrated Connecticut hat manufacturing town turns out a lot of boys who take an electrical course. And they then do small jobs for any price. And there is practically no electrical inspection in town. Why not?

## Contractor's Slogan

The Atlee Schumaker Electric Company of Baltic, Ohio has a slogan—"We sell the best and repair the rest." They feature it on their letterhead with some little sketches that attract the eye and get the message over.

## Milkman's Matinee

If you don't believe electrical contractors are interested in fluorescent lighting, listen to this! At a meeting in New Brunswick, N. J., the Public Service Electric and Gas Company gave a dinner and Sam Hibben of Westinghouse Lamp told the fluorescent story. Then they asked questions—and the meeting lasted until 2 A.M.

## Profitable Leisure

E. S. Springfield, president of the Tri-State Electric & Machine Co., motor repair shop of Moundsville, W. Va., usually spent his leisure making the gray matter work overtime. The net result is that he is now the proud owner of a patent for a cable coating device used to paint electric cables along railroads. He has several of the complicated looking devices on the production line in his shop now.



**FIELD SUPERVISORS** Harold Beall (left) and Russel V. Thompson, had the responsibility of overseeing the field lighting and control installation at the new Washington National Airport, Gravelly Point, Va. Harold and "Tommy" handled the details for the H. P. Foley Co., electrical contractors who did the work.

Electrical Contracting, July 1941

# TO SAVE INSTALLATION TIME USE G-E RW WIRE IN MOIST LOCATIONS INSTEAD OF LEADED WIRE

RIC --- 12 RW 600 V --- MOISTURE RESISTANT G

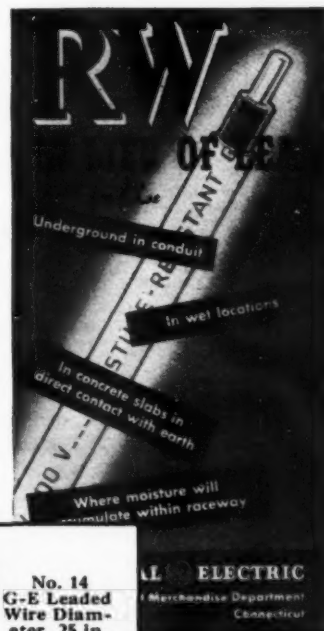
You can install G-E Type RW Moisture Resistant Building Wire more quickly than leaded wire because: it is lighter in weight and more flexible; it is easier to strip and splice; it can be pulled through raceways more easily.

G-E RW Wire is approved by the Underwriters' Laboratories for use in lieu of leaded cable in raceway systems as follows:

1. Underground
2. In concrete slabs or masonry in direct contact with the earth
3. In permanently moist locations
4. Where the accumulation and condensation of moisture within the raceway are likely to occur.

More conductors can be used in a conduit or duct with this wire than with leaded wire; or smaller raceways can be used. G-E Type RW wire is similar in construction to other G-E braided building wires except that its insulation is made of a special low moisture absorption rate rubber compound.

For further information see the nearest G-E Merchandise Distributor or mail the coupon for a folder containing detailed data on this wire.



No. 14  
G-E Type  
RW Diam-  
eter .19 in.



No. 14  
G-E Leaded  
Wire Diam-  
eter .25 in.

Relative Diameters Are Same for  
Other Wire Sizes

GENERAL ELECTRIC  
Merchandise Department  
Connecticut

SEND COUPON  
FOR THIS FOLDER

General Electric Company  
Section W-187  
Appliance and Merchandise Dept.  
Bridgeport, Connecticut

Sirs: Please send me your folder on G-E Type RW Moisture Resistant Building Wire.

Name.....

Address.....

City..... State.....

GENERAL  ELECTRIC

# EQUIPMENT *News*

## Motor

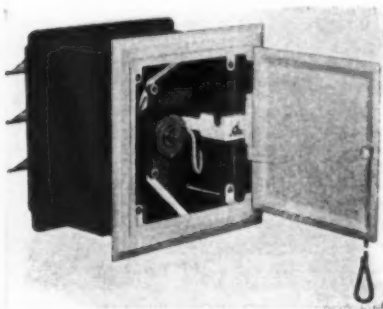
This explosion proof motor is constructed to meet specifications for Class I, Group D installations, where surrounding atmosphere is charged with explosive quantities of acetone, alcohols, gasoline, lacquer, naphtha, natural gas, petroleum or solvent vapor. Motor is constructed so it will resist pressure of an explosion of any of these gases should one occur inside the motor and not cause an explosion in similar atmosphere outside the motor. Century Electric Company, St. Louis, Mo.



CENTURY EXPLOSION PROOF MOTOR

## Kitchen Fan

The automatic lever-operated shutters has been added to the V-50A kitchen wall box vent fan. Other features include—totally enclosed motor, rubber mounting for motor, 10-in. fan, telescopic adjustment for wall thickness from 6- to 24-in. detachable plug, inside door for extra weather protection, close fitting shutters. The opening and closing of door with handle starts and stops motor and also opens and closes shutters. Signal Electric Mfg. Co., Menominee, Mich.



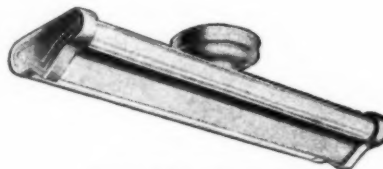
SIGNAL KITCHEN FAN



TRUMBULL MULTI-BREAKER

## Multi-Breaker

A new enclosed industrial multi-breaker has been developed. Equipped with non-tamperable units, with both thermal and magnetic trip, which provides time delay on small overloads and instantaneous operation on short circuits and high overloads. Tripping is indicated through target in front cover. For surface mounting, 2 and 3 pole, 230-volt, a.c. rating. Available in two frame sizes—M-1, 50 ampere maximum; M-2, 100 ampere maximum. Trumbull Electric Mfg. Co., Plainville, Conn.



MITCHELL KITCHEN UNIT

## Fluorescent Lighting Unit

This new fluorescent lighting unit is for permanent installation in the kitchen. It uses two T-12, 20-watt, 24-in. fluorescent lamps. Comes with specially made ceiling holder and ceiling strap to fit on standard 4-in. outlet box. Canopy also has knock-out for switch. Reflector is finished in white enamel. For operation on 110- to 125-volts, 60 cycles, a.c. current. Mitchell Manufacturing Co., 2525 Clybourn Avenue, Chicago, Ill.



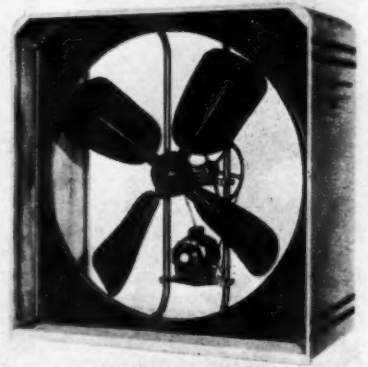
ALLEN-BRADLEY STARTER

## Combination Starters

A new line of Bulletin 712 combination starters has been developed to replace the former Bulletin 712 starters. A handle-locking arrangement and compact, high-capacity disconnect switch are among new features. Available in four sizes in a variety of enclosures, with or without fuse clips. Ratings range from 2 hp., 220-440-550-volt for size 0 starter, to 30 hp., 220-volt and 50 hp., 440-550-volt for size 3 starters. Locked rotor currents are disrupted by either solenoid switch or disconnect switch. Disconnect switch lever is located in front. Allen-Bradley Company, 1311 S. First St., Milwaukee, Wis.

## Home Cooling Unit

This new home cooling unit is designed for adaption to the varying needs of different types of homes. Units are available in three sizes so that capacity for air delivery may be based upon size of house. Air from lower floors of house is drawn through grille between attic floor and ceiling of central hallway or room. Suction chamber is built over grille to serve as tunnel for air travel and is designed to facilitate movement from all parts of house into attic. Fan unit is installed at open end of suction chamber and is joined to it by a canvas strip. General Electric Co., Bridgeport, Conn.



G-E HOME COOLING UNIT

[illegible]

Many contractors prefer to mount porcelain outlet boxes with screws on wood supports. Others have found the conventional box hanger a convenient and time-saving method and one to which they have become accustomed. This is true, particularly in concealed ceiling mounts. Here the well-known slotted box hanger is used and the box is attached by means of  $\frac{3}{4}$ " number 10 stove bolts. Plenty of knockout openings are provided in porcelain outlet boxes to permit entrance of wires or cables without contact with the box hanger. These may be used for supporting porcelain junction boxes also.

Fixtures far heavier than the present-day commercial types may be supported to porcelain ceiling boxes, and ample protection to the wire con-

**Defense Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for defense needs.**

All available commercial types of wiring devices, such as switches, duplex outlets, etc., will fit porcelain switch and outlet boxes. All combinations possible in other types of boxes may be installed in Porcelain Boxes.

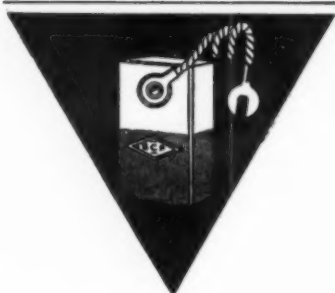
Because porcelain box application requires no clamps, additional wiring space is available. And, due to their

Porcelain manufacturers have studied the needs of the electrical contractor in preparing materials for adequate Modern Porcelain Protected Wiring Systems and are prepared to supply materials for complete Porcelain Installations.

**Knox Porcelain Corporation,  
Knoxville, Tenn.**  
**Illinois Electric Porcelain Company,  
Macomb, Ill.**  
**Porcelain Products, Incorporated,  
Findlay, Ohio**

*Electrical Contracting, July 1941*

*A Little Thing  
like a Carbon Brush  
Needs "BIG" EQUIPMENT  
to produce  
"SUPERIOR" QUALITY*



The buyer of brushes for industrial motors and generators knows that every piece of equipment used in plant operation must be "big league" calibre.

Thru the many years that Superior Carbon Products, Inc., has been in the business of manufacturing brushes, the industry has witnessed constant improvement in the product—to meet the requirements brought about by new developments or changes in the design of electrical machinery—and today to meet the swift pace set by National Defense Programs where action plus accuracy is the by-word.

**For  
CARBON, GRAPHITE and  
METAL-GRAPHITE BRUSHES  
FOR GENERATORS, MOTORS  
AND ROTARY CONVERTERS.  
Carbon, High-Metal and  
Metal-Graphite Plates . . .  
Carbon Brush Strips, Moulded  
Contact Carbons and Carbon  
Specialties . . .**

be sure to specify "Superior"

Also brushes for fractional horsepower motors of all types.

**SUPERIOR  
CARBON PRODUCTS INC.**

9115 George Ave. Cleveland, Ohio



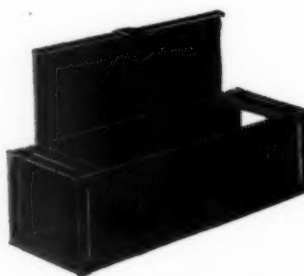
**All That The Name Implies**

## EQUIPMENT *News*

[FROM PAGE 96]

### Wireway

This new 4 by 4 Wirewa is an enclosed metal raceway designed to house and protect cables and wires. It is approved for use in installation of feeders, branch circuits, control and signal wiring to a maximum of 600-volts. Standard sections are fitted with hinged, spring-latched covers and knockout clusters arranged in sides and bottom. Sections are joined together by clamp type connection couplings. It may be mounted direct to wall for  $\frac{1}{2}$ -,  $\frac{3}{4}$ -, 1-,  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -inch conduit. National Electric Products Corporation, 1000 Fulton Building, Pittsburgh, Pa.



NATIONAL ELECTRIC WIREWA

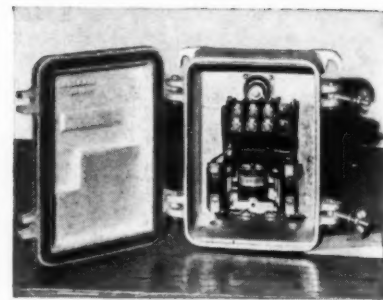
### Motor Control Centers

A new line of motor control centers is now available. It represents an assorted assembly of sizes 1, 2 or 3 combination magnetic starter units of standardized width in vertical section troughs, in which power is supplied through busbars. These assemblies may be located in one central point, or larger centers may be divided into smaller sections and distributed as is most convenient for machine layout. Immediate connection is made between motor control center and load by inserting starting units, which are equipped with stabs, onto busbars in power trough. All interior parts are accessible from the front. The Trumbull Electric Mfg. Co., Plainville, Conn.



TRUMBULL MOTOR CONTROL CENTERS

### Magnetic Starter



G-E MAGNETIC STARTER

This lift-type full-voltage magnetic starter is suited to control of small condensing units, domestic air-conditioning fan motors or any a.c. motor where quiet operation is important, as in restaurants, hotels, hospitals or commercial establishments. Control handles motors up to 5 hp. and 220-volts, starting, stopping and protecting them from overloads and overheating by means of manual or automatic reset isothermic overload relays. It is mounted in watertight housing. Switch is available in 110-volts, single-phase,  $1\frac{1}{2}$  hp. and 3-phase 3 hp.; 208- or 220-volts, single-phase 3 hp. and 3-phase 5 hp.; 440- to 600-volts, single-phase 5 hp., and 3-phase  $7\frac{1}{2}$  hp. Frequencies are of 60, 50, 40 and 25 cycles. General Electric Co., Schenectady.

### Multi-Breaker



SQUARE D MULTI-BREAKER

This new industrial multi-breaker is for use on 230-volt a.c. systems. Both 2 and 3 pole forms are available in capacities from 15 to 100 amperes. Enclosure is dust-resisting. Operating mechanism is mounted on cover of box. The 50-ampere size measures  $11\frac{1}{2}$ -in. high by 6 $\frac{1}{2}$ -in. wide and 100-ampere  $13\frac{1}{2}$ -in. high by 9 $\frac{1}{2}$ -in. wide. Breaker is common trip so that overload on any pole will cause all poles to trip simultaneously. A thermal element affords time lag on momentary overloads while magnetic trip causes instantaneous tripping on heavy short circuits. Square D Company, 6060 Rivard St., Detroit, Mich.

*Electrical Contracting, July 1941*

# LEVITON

These are but a few of the fine Leviton wiring items produced by Leviton for residential, commercial and industrial work. You will find them all good profit makers . . . your end of their up-to-the-minute design and manufacture in Leviton's modern plant.

Have you seen Leviton's latest devices? Ask your wholesaler to show them to you. Or, if more convenient, drop us a line, and we will gladly send a sample and complete details on any item you may wish.



CAT. NO. 377



CAT. NO. 381

All types of Fluorescent fixture devices — push in type — sturdy construction and easily mounted. Can be mounted with either 2 screws or with 1 screw as shown.



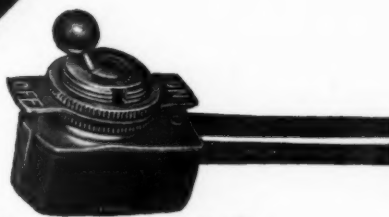
CAT. NO. 380



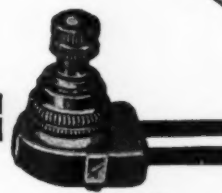
CAT. NO. 689

## PULL CHAIN CANOPY SWITCHES

Rated 3A-250V, 6A-125V T (T rated for Type C loads) These switches are made in Single Pole, two circuit and two speed types and are adapted to fit low canopies. The body of the switch is only 1 3/16 inches in diameter by 1 inch overall height, and contains a very fine accurate snap action mechanism. Can be used on Fluorescent Fixtures or appliances requiring this high rating.



CAT. NO. 720



CAT. NO. 572

## LEVITON KWIKCHANGE LINE

COMPLETE WITH EVERY TYPE OF DEVICE

DESIGNED TO MEET ALL MODERN NEEDS

ASK FOR COMPLETE KWIKCHANGE CATALOGUE

WRITE FOR CATALOG

**LEVITON MANUFACTURING CO.**  
236 GREENPOINT AVE., BROOKLYN, N. Y.

111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

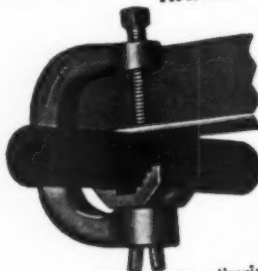
## FLOOR BOXES and WIRING SPECIALTIES

### No. 284 DUPLEX RECEPTACLE NOZZLE



Compact and neat. Available with 1/2" or 3/4" brass pipe extension. Also Latrobe Duplex Telephone Nozzles.

### No. 470 PIPE OR CONDUIT HANGER



Pipe support turns freely, allowing pipe to run parallel or at right angles to beam. Does away with drilling or use of straps. Handles 1/2", 3/4" and 1" pipe to steel beams 3/4" thick.

### No. 150 BOX with No. 207 NOZZLE



of boxes are easily adjusted.

• The Latrobe Line is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time... an important point to consider when selecting floor boxes and wiring specialties.

*Write for details TODAY!*  
**FULLMAN MFG. CO.**  
LATROBE • PENNA.

## EQUIPMENT *News*

[FROM PAGE 98]

### Fluorescent Unit

A fluorescent fixture for both household and commercial use has been designed. It features the DuPont "Plastacele" diffusing shield, which hides lamp bulbs entirely from view. It uses two 20-watt, 24-in. T-12 fluorescent bulbs. Available in ivory, white enamel and bronze finishes. It is completely wired, ready to hang. Recommended for use in kitchen, bedroom, bathroom, library, playroom, den, hotel rooms, lobbies, hallways and corridors. Mitchell Manufacturing Co., 1550 Dayton Street, Chicago, Ill.



MITCHELL FLUORESCENT UNIT

### Switch

This single pole switch is designed to fit No. 2100 Plugmold multi outlet system where it is desirable to have one or more outlets switch controlled. The Wiremold Company, Hartford, Conn.



WIREMOLD SWITCH

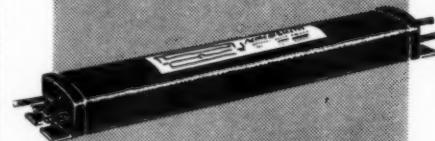
### Starter Socket

A remote control starter socket for fluorescent lighting units has been designed. It may be mounted at any distance from unit and in any position convenient for insertion or removal of starter without disturbing lamp itself. It uses the "lobster claw" dual contact and lock. It has positive contact and prevents starter shaking loose. Lloyd Products Company, 69 Gordon Ave., Providence, R. I.



LLOYD STARTER SOCKET

## Specify ACME FLUORESCENT BALLASTS



for **BETTER  
PERFORMANCE**

• For better performance of fluorescent lighting fixtures,—investigate the advantages of Acme ballasts. Write for samples of Acme ballasts in ratings you use. Test their performance in comparison with any other make of ballast and you'll see how Acme balanced design provides for equal secondary voltage for each lamp,—eliminates flickering and only partially operating units. Notice too, that Acme ballasts are QUIET. Most quality fluorescent manufacturers have standardized in Acme ballasts.

**THE ACME ELECTRIC & MFG. CO.**  
36 Water St. Cuba, N. Y.

**Acme Electric**  
TRANSFORMERS

### DRILL CONCRETE the Easy Way



The old arm and hammer method is slow, hard and expensive. Use the Wodack "Do-All" Combination Electric Hammer and Drill and drill 15 times as fast in concrete and masonry. Two tools in one. With hammer member removed it's an electric drill with 1/2" chuck. Cuts cost of drilling for expansion anchors. Universal motor 110 or 220 v. Ask for Bulletin.  
**WODACK ELECTRIC TOOL CORP.**  
4628 W. Huron Street - Chicago, Ill.  
Phone AUSTIN 9866

## Ads Helpful!

*They are full of data on*

- new products
- new methods
- profitable buying
- profitable selling

So read them all—you'll be well repaid for your time!

**IT PAYS to read  
Electrical Contracting**

### Cable Dead-End

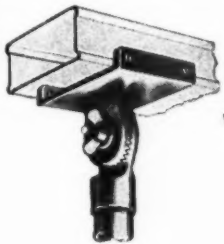
The type YE dead-end is available for all sizes of cable from No. 8 to 2,000MCM. The thick-walled cable socket is indented on cable end by means of a hydraulically actuated, portable press. Various types of clevis arrangements can be supplied to meet specific requirements. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.



BURNDY CABLE DEAD-END

### Ratchet Hanger

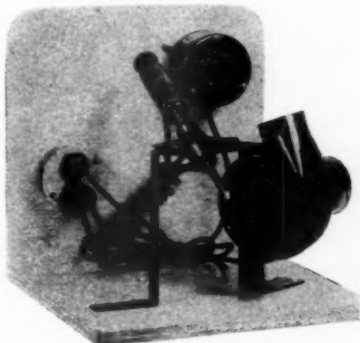
New adjustable ratchet hanger fitting (No. 3008F) is designed to attach to No. 3000 Wiremold fluorescent lighting channel. It permits adjustment of fluorescent lighting fixture to desired angle. The Wiremold Company, Hartford, Conn.



WIREMOLD  
RATCHET  
HANGER

### Soldering Iron Set

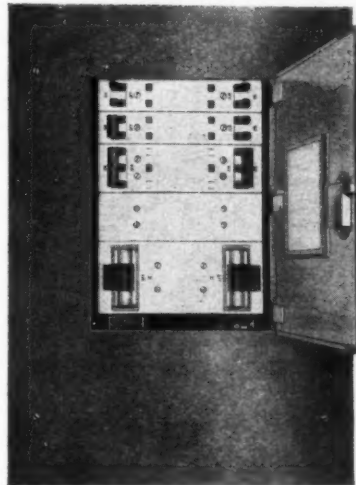
This soldering iron production set consists of soldering iron, rheostat, blower and supporting stand to hold iron. Stand can be supplied to hold iron at any height or angle. Rheostat gives heat control. Blower carries away all smoke and flux fumes from operator, permitting a close, clear view while soldering on small assemblies. Exhaust of blower may be piped to outside air if desired. Vulcan Electric Co., 600 Broad Street, Lynn, Mass.



VULCAN SOLDERING IRON SET

## HOW TO BEAT DEADLINES

on  
rewiring and  
installation  
of  
**POWER  
CIRCUITS**



You'll save time in installation . . . you'll eliminate "special layouts" and engineering work . . . you'll guarantee your customers the

very latest development in protection against machine "outage" and you'll be able to offer cost savings . . .

## with the NEW "MH" TRUMBULL MULTI-BREAKER POWER DISTRIBUTION PANELS

- **GREATER SPEED** in installation because boxes are standardized, more compact (only 5 3/4" deep), carried as stock.
- **BETTER PROTECTION** because Multi-Breaker Units have correct precision time-lag and because service can be restored instantly by the "flip of a handle" when line is cleared. No replacements, no maintenance.
- **COST SAVINGS . . .** Full *automatic* overload protection at a cost comparable with fused equipment.

Available in 15-100 amp. capacities; 125-230V. A. C. Single Phase, and 230V. A. C. 3 Phase.

Trumbullaid Bulletin No. 325 available on request.

ESTABLISHED 1895

THE TRUMBULL ELEC. MFG. CO.

T

PLAINVILLE CONN. U.S.A.

**Trumbull Cheer**

**KEEP Alert ELECTRICALLY**  
use your **TRUMBULLAIDS**

**TRUMBULLIST**

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## Modern Defense for Portable Cords and Cables

The chief enemy of portable cord and cable performance is the abrasion they almost always get even with ordinary use and care. Until Simplex developed "TIREX Selenium Rubber Armor" — a tough, flexible rubber sheath that is unexcelled for resistance to abrasion — no really practical defense against abrasion was obtainable for the cords and cables upon which electrical tools and other equipment depend for profitable operation.

Modern, practical protection for portable cords and cables is fully described in our booklet "TIREX Cords and Cables". You should have a copy in your files. May we send one to you?

**SIMPLEX WIRE & CABLE COMPANY**  
79 Sidney Street, Cambridge, Massachusetts

## How to wire for light and power



JUST OUT—2nd EDITION OF RICHTER'S

### PRACTICAL ELECTRICAL WIRING

500 pages, illustrated, \$3.00

#### IN ACCORDANCE WITH THE 1940 CODE

Here is a complete course of instruction for those who want to learn how to do electrical wiring. Begins with very first elements and takes the reader by easy steps, plain instructions and methods, to the completion of typical wiring jobs in accordance with official requirements of the 1940 National Electrical Code. Employs simple language; confines mathematics and theory to the minimum necessary for understanding of the work; covers medium voltage jobs of the types that are most in demand.

#### 3 parts cover residential, farm and industrial wiring

1. Underwriters and codes; electrical principles and measurements; basic devices and circuits; wire, sizes and selection; connections and joints; residential and farm motors; etc.

2. Planning an installation; specific outlets; switches and other devices; old work; farm wiring; isolated lighting plants; wiring apartment houses, etc.

3. Planning non-residential installations; non-residential lighting; miscellaneous problems; wiring for motors; wiring schools, offices, stores, and churches, etc.

#### MAIL THIS COUPON FOR 10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Richter's Practical Electrical Wiring for 10 days' examination on approval. In 10 days I will send \$3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

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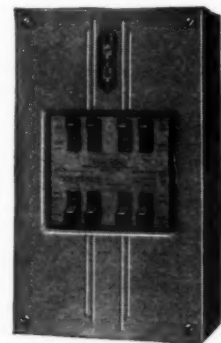
Company ..... E.C. 7-41  
(Books sent on approval in U. S. and Canada only.)

EQUIPMENT *News*

[FROM PAGE 101]

#### Breakers

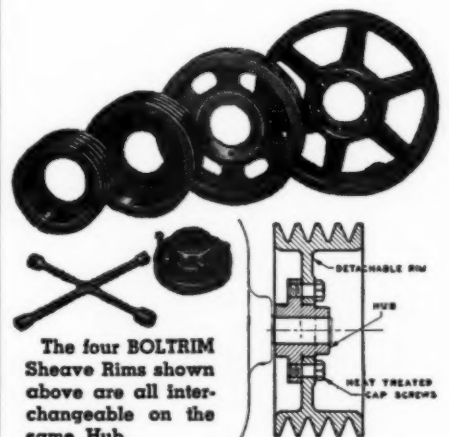
A new line of improved flush and surface breakers has been designed. A stock of three sizes of boxes accommodates combinations of all "CB", "C-1", "CBC" type breaker units. As breaker units may be ordered in parts, boxes can be delivered when needed for roughing in. Breaker units are delivered later when wiring is to be completed, allowing for last minute changes in wiring plans. The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn Street, Hartford, Conn.



ARROW-HART & HEGEMAN BREAKERS

#### Sheave-Hub Combination

The Boltrim sheave is designed so that rims of varying diameters and face widths can be mounted. Rim is attached to hub with heat-treated cap screws, making it possible to quickly and easily remove rim without removing hub from shaft. Four different hub positions may be secured on same sheave. Available in wide variety of sizes, ranging in diameter from 7.4-in. P.D. to the largest. May be had with any standard number of grooves and to fit all standard sizes of V-belts. Fort Worth Steel & Machinery Co., Fort Worth, Texas.



The four BOLTRIM Sheave Rims shown above are all interchangeable on the same Hub.

BOLTRIM SHEAVE-HUB COMBINATION

## Lighting Unit

This new 150-watt commercial fluorescent lighting unit is for high level illumination. It uses the 65-watt 36-inch fluorescent lamps. Some of the advantages claimed for the Miralume C-150 are higher levels of light; easy to install; high power factor; cool light; soft diffused light; trouble free starting and easy maintenance. It has Miracoat reflector and frosted plastic panels. Recommended for use in shops and stores, offices, theatres, restaurants, schools and public buildings. Hygrade Sylvania Corporation, Salem, Mass.



HYGRADE MIRALUME C-150 UNIT

## Lugs

This new solderless, "Screw-Tite" lug is the set screw type made of seamless, electrolytic copper with heavy brass check-proof shell that reduces heating. Full current carrying capacity is evenly distributed from wire to lug. Eight sizes are available for No. 14 wire to 2,000,000 cm. cable. Each size is suitable for wide range of wire. One or two-hole types are available with square or round ends. Special sizes and angular types are also available. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.

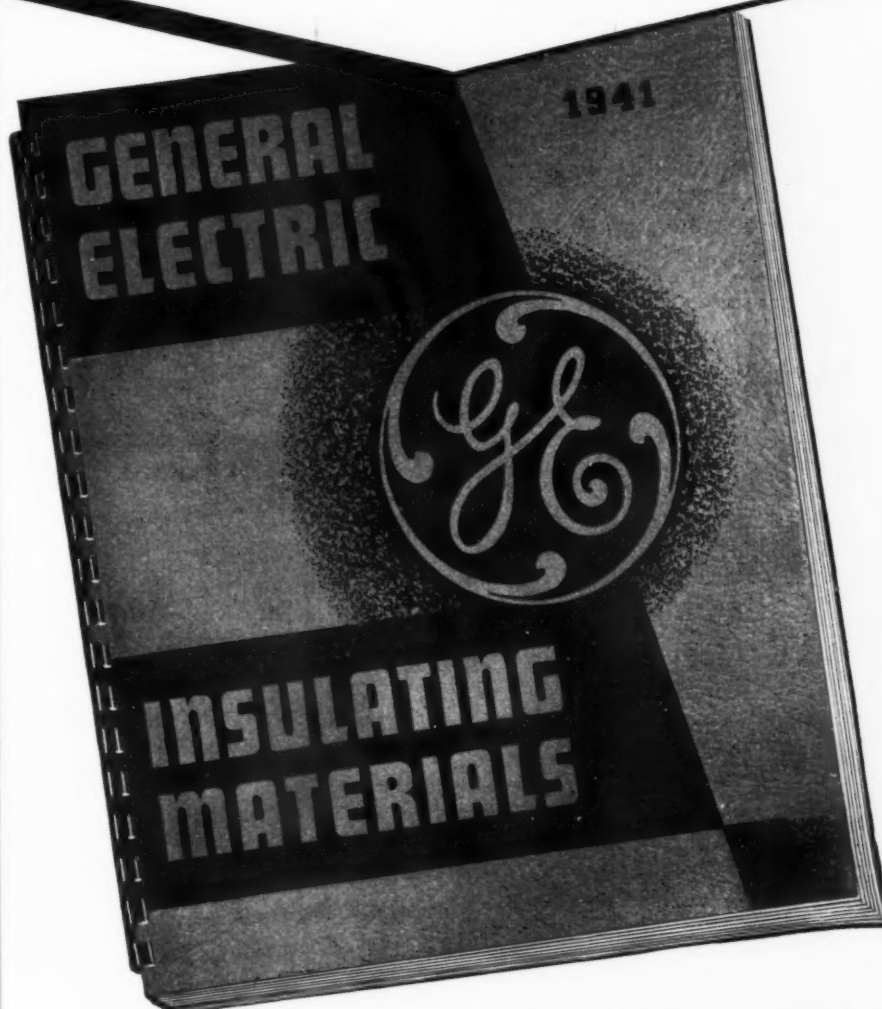


IDEAL SOLDERLESS LUG

## Fluorescent Starters

Two new 4-pin fluorescent starters, Nos. FS64 and FS74, have been developed. The former is for the 60-in. 100-watt lamp and the latter is for the 36-in. 65-watt lamp. Starter sockets for remote mounting and also for attached lampholder mounting are available for 4-pin starters. Starter sockets which take the 4-pin starters will also take the 2-pin starters. The Bryant Electric Co., Bridgeport, Conn.

# A **NEW** CATALOG FOR YOU



## The **NEW** G-E INSULATING MATERIALS CATALOG Is Now Available

Crammed with pictures, descriptions, tables, specifications, etc., it consists of an up-to-the-minute listing of General Electric's complete line of outstanding Insulating Materials.

This catalog will be of real help to you when you are planning purchases for installation, repair, and maintenance supplies.

## GET YOUR FREE COPY NOW!

Just Use This Coupon  
We'll Hurry Your Copy To You

Section M-187.  
Appliance & Merchandise Department,  
General Electric Co., Bridgeport, Conn.  
Send me a copy of the NEW G-E INSULATING MATERIALS CATALOG right away!

Name.....

Address.....

City.....

**GENERAL  ELECTRIC**

### **DOLPH'S Chinalak Saves \$400 Rewinding Charge**

Long Island City, N. Y.—How DOLPH'S No. 7 CHINALAK Black Baking Varnish saved a \$400 motor rewinding cost was revealed recently by the Electro Winding Service Company of Long Island City. When other parts of the motor had to be replaced, the CHINALAK insulated coils were found in perfect condition, this company reported.

The motor in question was a squirrel cage, open type, 60 hp.—220 volt—3 phase—2 speed (600—1200 rpm) motor. The stator was of the open slot construction and the stator coils were impregnated with DOLPH'S CHINALAK.

### **Rotor Bars Open About 20%**

After the coils were placed in the stator and the motor placed on the line, it was discovered that the rotor bars had opened to about 20 percent of the rotor circumference and the resultant magnetic side pole on the rotor had caused rubbing of the rotor. This rubbing occurred despite the fact that the bearings were in good condition and the air gap at stand still being normal.

### **Frictional Heat Results**

Frictional heat due to this rubbing resulted in a high temperature rise throughout the motor to the extent that the slot wedges became seriously carbonized. In addition, the slot cells were also carbonized to a depth of about 25 percent. Further examination revealed that the stator coils were in excellent condition and not at all affected by the high temperature.

Reconditioning of this motor, the company pointed out, simply called for the insertion of new slot cells and wedges, and, of course, the brazing of the open rotor bars.

### **CHINALAK Receives Praise**

Mr. Carl Badura, of the Electro Winding Service Company where the stator coils were wound, expressed the belief that DOLPH'S No. 7 CHINALAK Black Baking Varnish was responsible for the fact that the coil insulation was not damaged and that the use of CHINALAK on this particular job saved \$400 that would have had to be spent should the coils have had to be rewound.

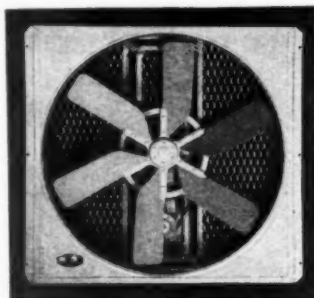
Further information and other interesting case histories on CHINALAK Black Baking Varnish may be obtained by writing the JOHN C. DOLPH Company, 168A Emmett Street, Newark, New Jersey. ADV.

## **EQUIPMENT *News***

[FROM PAGE 103]

### **Window Fan**

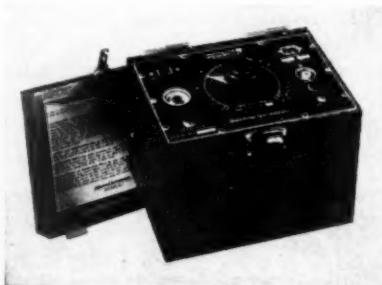
Type 28-W window fan is ready for instant mounting and operation. Side mounting flanges fasten directly to inside or outside frame of any ordinary size window. May be placed in upper or lower half of window without interfering with normal operation of window sash. Larger side flanges available for wider windows. Adjustable diameter motor pulley permits changing fan speed to suit job. Equipped with reversible motor and reversing plug on electric cord for blow-in or exhaust operation. Overall width, including side mounting flanges, 33-inches; overall height, 31-inches. American Coolair Corp., Jacksonville, Fla.



COOLAIR WINDOW FAN

### **Instrument**

The Series MB megabridge has been developed for the simplified checkup of leakage resistance, particularly in production test routine and out in the field. It has a one-dial operation and direct reading. To obtain resistance measurements, knob is rotated until dark angle of null indicator remains unchanged with "detector" button depressed. High-voltage terminal assembly is guarded against any leakage over surface of terminals, and internal wiring, so high humidity conditions do not affect readings. Instrument measures 8- by 5- by 5½-inches high. Instrument is provided with three test leads, power line cord and tubes. Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.



INDUSTRIAL MEGABRIDGE

# **Something to Anticipate!**



**A ROUND-UP OF TIME AND LABOR SAVING IDEAS FOR ELECTRICAL CONSTRUCTION**

*50 Ways to Save Time and Money on Wiring*



**IDEAS TO KEEP THE PLANT HUMMING**

*A Check Chart of the Vital Spots for the Maintenance Man to Watch*

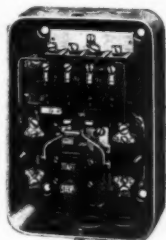


**HOW FOUR CONTRACTORS HAVE JOINED UP TO SWING A BIG DEFENSE PROJECT**

# **It will all be in the big OCTOBER ELECTRICAL CONTRACTING**

## Starters and Contactors

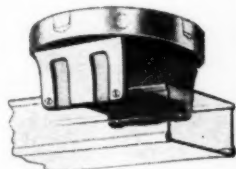
A complete new line of magnetic solenoid starters and contactors, sizes "0" and "1" has been developed. Separate bakelite units for each pole confine arc and exclude dust. All connections are made from front, and coils with visible ratings are easily changed. Separate electrical interlock switch, enclosed in bakelite, is supplied normally open or closed. Reset button is independent of cover. Positive quick make and break switching mechanism in overload relays is insulated from bimetal and heater. For control of motors up to 7½ hp., single or polyphase, 110-550-volt, a.c. The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn Street, Hartford, Conn.



A-H & H. STARTERS  
AND CONTACTORS

## Outlet Box Adaptor

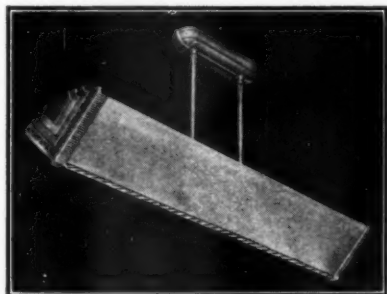
This ceiling outlet box adaptor is for suspending Wiremold fluorescent units and No. 3000 fluorescent channel from existing outlets. Canopy has twist-outs for standard Wiremold 200, 500 or 700 raceway. The Wiremold Company, Hartford, Conn.



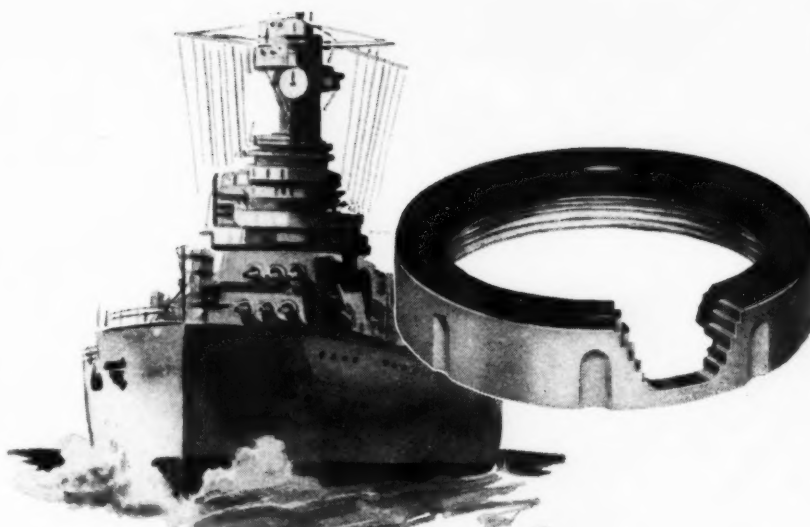
WIREMOLD  
ADAPTOR

## Fluorescent Fixture

This four light fluorescent glass enclosed fixture is for use in stores, offices, schools and general illumination. Available for 24- or 48-inch lamps. It has satin aluminum finish, with frosted, ribbed glass panels on either side, and a twisted crystal rod where glass panels meet at bottom. Overall length 26 and 50 inches. Pickwick Metalcraft Co., 489 Broome St., New York, N. Y.



PICKWICK FLUORESCENT FIXTURE



# DEFENSE

## Against

## Abrasion and Grounds

Under existing accelerated load conditions, accidental troubles in cable lines must be carefully guarded against.

O.Z. Insulated Bushings at every entrance assure perfect protection. Insulating Bakelite is molded and locked into the casting providing a solid, one-piece bushing. For mechanical strength and positive bonding, castings are of the highest grade malleable iron.

O.Z. Insulated Bushings are made in Conduit Type and Set Screw Type, and in all conduit sizes from ½-inch to 6-inch. They can also be furnished with Solderless Lugs to provide a quick positive ground connection.

*Send for Bulletin 105 which completely lists these O.Z. Insulated Bushings as well as Conduit Fittings and Solderless Connectors.*

*Have you our latest literature on Terminating Potheads and Sealing Glands also Bulletin on Heavy Duty Power Connectors and Ground Fittings?*



## O. Z. PRODUCTS

- Cable Supports
- Insulated Bushings
- End Fittings
- Split Couplings
- Expansion Fittings
- Solderless Lugs, Connectors and Covers
- Terminating Potheads
- Sealing Glands
- Sealing Bushings
- Heavy Duty Power Connectors
- Grounding Fittings

**O. Z. ELECTRICAL MFG. CO., INC.**  
262 BOND ST. Representatives in Principal Cities **BROOKLYN, N. Y.**

# ANSWERING YOU

## 1942 EDITION IN PREPARATION

**MANUFACTURERS:** Write for full details on this economical and effective means of distributing catalog data to 30,000 electrical buyers.

**RUEBLING**

*Electrical*  
**WIRES AND CABLES**

*Electrical Wires  
and Cables*

**YOUR**

# **T & D QUESTIONS**

When you're buying or specifying transmission and distribution equipment, make Electrical Buyers Reference your *first* source of information.

Because—bound into this *one* volume are the condensed catalogs of 49 leading manufacturers of high voltage equipment . . . over 90 pages of specifications on their products, addresses of sales representatives, technical data, and so on.

Check over the list of these "T & D" manufacturers who are cataloging their products in the 1941 Electrical Buyers Reference. . .

How many of the catalogs of these companies can you find *quickly*? How many of them would you keep on your desk, in one compact volume?

Allis-Chalmers Mfg. Co.  
American Brass Co.  
American Steel & Wire Co.  
American Transformer Co.  
Austin Co., M. B.  
Bell Lumber & Pole Co.  
Brown Co.  
Clover Co., F. G.  
Cope, Inc., T. J.  
Cornell-Dubilier Electric Corp.  
Delta-Star Electric Co.  
Eastern Specialty Co.  
Electric Power Construction, Inc.  
Electric Power Equipment Corp.  
Electric Service Supplies Co.  
Electrical Engineers Equipment Co.  
Erie Electric Co.

Fast & Co., John E.  
Fibre Conduit Co.  
Gardner Electric Mfg. Co.  
General Electric Co.  
Illinois Electric Porcelain Co.  
Imperial Porcelain Works, Inc.  
I-T-E Circuit Breaker Co.  
Johns-Manville Corp.  
Kuhlman Electric Co.  
Moloney Electric Co.  
M & W Electric Mfg. Co.  
National Pole & Treating Co.  
Naugle Pole & Tie Corp.  
Okonite Co.  
Pacific Electric Mfg. Corp.  
Page & Hill Co.  
Partridge Lumber Co., T. M.

Pennsylvania Transformer Co.  
Porcelain Insulator Corp.  
Reliable Electric Co.  
Rockbestos Products Corp.  
Roebbling's Sons Co., John A.  
Roller-Smith Co.  
Scott Pole & Treating Co.  
South Bend Current Controller Co.  
Spero Electric Corp.  
Standard Transformer Co.  
United States Rubber Co.  
Valentine Clark Co.  
Victor Insulators, Inc.  
Wagner Electric Corp.  
Westinghouse Electric & Mfg. Co.

This is just what Electrical Buyers Reference does: it puts your buying and specifying information at your fingertips, ready for instant service on today's rush jobs.

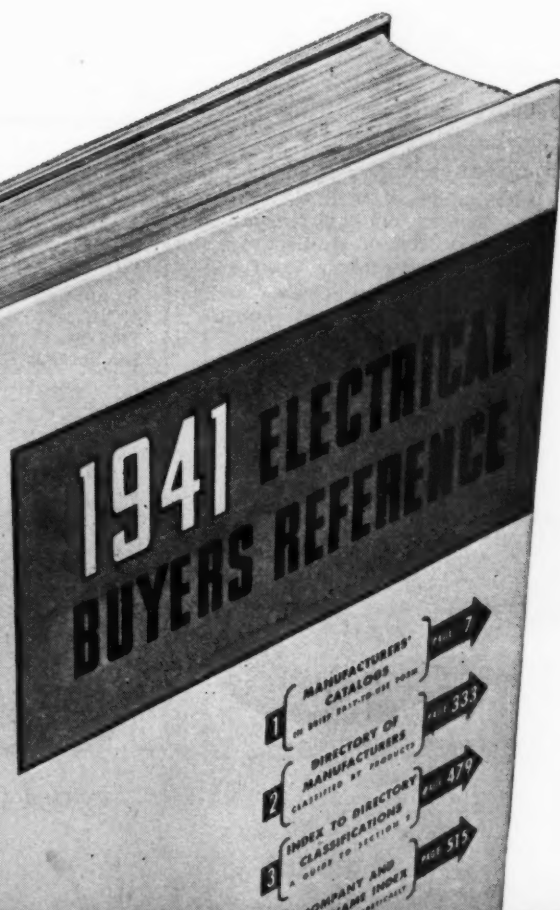
★ ★ ★

"T & D" equipment is but part of the Electrical Buyers Reference story. Only 49 companies are listed above . . . 189 other manufacturers have condensed catalogs in this reference volume . . . 338 pages of specifications and product data!

In addition, Electrical Buyers Reference provides you with a complete, product classified listing of 3500 manufacturers of electrical and allied products. Flip to the product, and you'll find the names and addresses of all known manufacturers of this product! Another index identifies trade names . . . and of course, there's a full cross-index of product classifications.

This is the kind of buying and specifying information you need . . . "who makes it" questions answered at the flip of a page. A closet-full of catalogs boiled down into one neat, serviceable volume! That's why we say, Use Your Electrical Buyers Reference . . . it saves time and boosts efficiency!

**McGraw-Hill Publishing Company, Inc.**  
330 West 42nd Street, New York, N. Y.



# BADGER

Synchronous  
ELECTRIC TIME SWITCHES

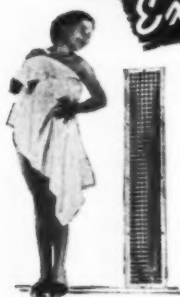


CONTRACTORS LIKE THEM BECAUSE:  
they are dependable and easy to install  
USERS LIKE THEM BECAUSE:  
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY  
1937 MEAD STREET RACINE, WISCONSIN

EVERY BATHROOM  
NEEDS THIS  
Extra HEAT



You need this bathroom heat every day in the year. When it's too warm for unit heat or too cold for unit heat alone—Thermador Built-In Bathroom Heaters are the answer. Just a flip of the switch and you are instantly blanketed in flameless, fumeless electric warmth.

## THERMADOR ELECTRIC BATHROOM HEATERS

THERMADOR ELECTRICAL MFG CO  
5119 So. Riverside Dr., Dept. EC7  
Los Angeles, California

Gentlemen:

Please send me complete contractors specifications and prices.

Name.....

Street.....

City.....State.....

## EQUIPMENT News

[FROM PAGE 105]

### Fluorescent Unit

A new 100 watt display unit, the D-100, has been added to the Miralume fluorescent lighting line. It is designed particularly for use in store windows, showcases and interior displays. It is 48½ in. long, 6 in. wide and 4½ in. in height. It comes complete with two 40 watt T-12 fluorescent lamps. Outside finish is bronze. Operates on 110-125 volts, 60 cycle, alternating current. Hygrade Sylvania Corp., Salem, Mass.



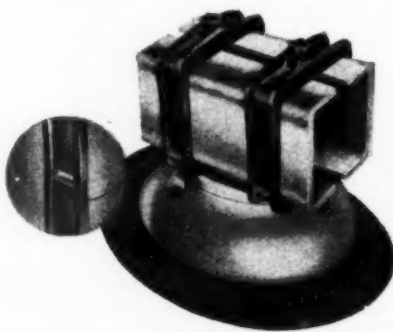
HYGRADE FLUORESCENT UNIT

### Insulating Material

A new line of varnish-saturated tubings for insulating bare wires has been developed. It is also for increasing dielectric strength of insulated wires when used as leads, connecting wires, etc. Tubings are made of woven cotton yarns impregnated with insulating varnishes. Varnishes penetrate through tubing rather than forming veneer laminations on surface. Tubings have high factor of flexibility and dielectric strength combined with low moisture absorption. Three grades are available, in sizes 20 to minus 1½, either black or yellow. General Electric Co., Bridgeport.

### Bus Support Clamp

Type BH bus support clamp is assembled to provide rigid support for channel busbar. Device may be used alternatively as slide fit support or rigid support by clamping caps in desired position. Center clamping studs and guide ridges insure proper spacing of copper channels. Can be furnished for use on either three or five inch bolt circle. Burndy Engineering Co., Inc., 459 East 133d Street, New York.



BURNDY BUS SUPPORT CLAMP

## SEARCHLIGHT SECTION

(Classified Advertising)

Employment : : Equipment

Business : : (Used or Resale)

### "OPPORTUNITIES"

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Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.  
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The advertising rate is \$8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.  
An advertising inch is measured ¾" vertically on one column, 3 columns—30 inches—to a page.

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AVIATION NEEDS ELECTRICIANS urgently for electrical installation work in aircraft manufacturing. Your previous experience, plus short, special aircraft training, leads to these interesting, good-pay jobs... which include radio and instrument installation. Training also is foundation for lifetime career in aircraft industry, in airline instrument maintenance work, or in Civil Service at Army and Navy aircraft maintenance depots. Write American School of Aircraft Instruments, Dept. E-7, 3903 San Fernando Road, Glendale, Calif.

### FOR SALE

#### \$40,000.00 Electrical Wholesale Business

Showing good turnover. Located in Indiana. Write

BO-23, Electrical Contracting  
520 No. Michigan Ave., Chicago, Ill.

## USED EQUIPMENT

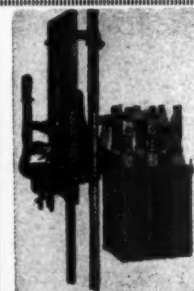
### ANOTHER OPPORTUNITY FOR ELECTRICAL DEALERS

You can buy completely overhauled and performance tested electric motors, generators, transformers, MG sets, welders, platers, etc., from Moreco and Resell at competitive prices and still make plenty profit. Send us your inquiries. We co-operate with dealers.

#### Here's a Bargain—Can you sell it?

100 KVA, Crocker-Wheeler, 3 phase, 60 cycle, 2300 volt, 257 RPM, size 1018-28 alternating current generator with direct connected exciter.

THE MOTOR REPAIR & MFG. CO.  
1560 Hamilton Ave. Cleveland, Ohio



OIL SWITCHES

AIR CIRCUIT  
BREAKERS

TRANSFORMERS

COMPENSATORS

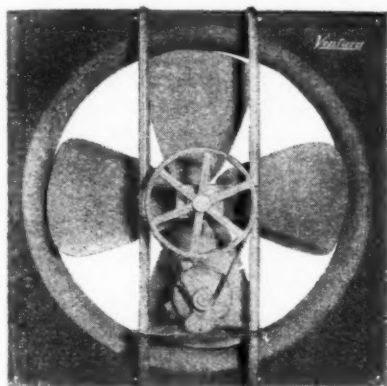
BOUGHT—SOLD

### CIRCUIT BREAKER COMPANY

Division of Electric Equipment Co.  
347 N. CLINTON AVE. ROCHESTER, N. Y.

## Fan

This Ventura fan is recommended for commercial use. Unit consists of 4-bladed wheel, steel wall plate with die formed inlet, shaft, rubber mounted fan bearings and V-belt drive assembled with motor mounted on air intake side. 60 cycle, single phase motors on sizes 24, 30 and 36 are long hour duty split phase totally enclosed. Single phase motors on size 42 and 48 are capacitor type. All motors are resilient mounted except d.c., 3 phase, 50 cycle and 25 cycle. American Blower Corp., 6000 Russell Street, Detroit, Mich.



AMERICAN BLOWER COMMERCIAL FAN

## Lamp

This new type of vibration service lamp is designed particularly for industrial and commercial use where high frequency vibration set up by motors and machinery in constant use, tend to weaken bulb filament. Also recommended for use where burn-outs are caused by vibration by rumbling trucks, as in store windows. It is made in a larger oversize bulb of wider diameter to increase convectivity of heated argon and nitrogen gases inside bulb. Stem unit has been shortened and made flexible. Available in 100, 150 and 200 watt sizes in five separate low voltages from 110- to 130-volts and in four separate high voltages from 220- to 250-volts. Wabash Appliance Corporation, 335 Carroll St., Brooklyn, N. Y.



WABASH LAMP

# WHERE TO BUY

Equipment, Materials and Supplies for  
Electrical Construction—Maintenance—Repairs

## TEST-O-LITE

Tests Everything Electrical  
From 100 to 550 Volts

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.



Only TEST-O-LITE, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also.

List \$1.50  
at leading jobbers.

**L. S. BRACH**

MANUFACTURING CORPORATION  
57 Dickerson St., Newark, N. J.



## WILEY "LEADER" FLEUR-O-LIER\*

\* Certified by  
Electrical Testing  
Laboratories



The most widely applicable Fleur-O-Lier—installed easily—either flush to ceiling or suspended. 2, 4, and 6 lamp sizes. Successfully used in stores and offices.

Write for Booklet EC-71

Good territories open for manufacturers sales representatives.

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## SUPERIOR SERVICE INSULATORS

Superior Quality Service  
Knobs and House Brackets  
SEND NOW for complete  
information and  
price lists.

**SUPERIOR PORCELAIN CO.**  
BOX 669 PARKERSBURG, W. VA.

## LOW VOLTAGE TATTLELITE



Range 3 to 25 volts. Tests automotive currents on aeroplanes, autos, trucks, etc.; telephones, temperature controls, doorbell circuits, radio, continuity tests where low voltage is used. Pocket size, sturdy. Price \$1.75 each.

## NEON TATTLELITE

Indicates voltages from 90 D.C. and 60 volts A.C. to 500 A.C. & D.C. Tests for live lines, polarity, blown fuses, grounded lines, etc. Will not "blow" like ordinary test lamp. Has "phone tip" prod. Price \$1.00 each. Write for Littelfuse catalog.

**LITTELFUSE, INC.**

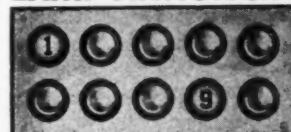
4789 N. Ravenswood Ave. Chicago, Ill.



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If the advertising in this issue  
does not supply the information  
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**ELECTRICAL CONTRACTING**  
330 W. 42d St., New York

## LAMP ANNUNCIATORS



How to  
Build  
Them!

Typical Annunciator Panel built with Underwriters Approved Kirkland #600 Buils-I-units for 120 volt service.

It is only necessary to provide holes in the panel for each indication, insert the single hole mounting units, and the assembly is ready to wire and use.

Write for New Catalogue  
Sold nationally by

**THE GRAYBAR ELECTRIC CO., INC.**

Mf'd by H. R. KIRKLAND, CO., Morristown, N.J.

**Electric Operators**  
For Any Overhead Type Door

**DOORS AND OPERATORS INC.**

See page 309  
Elec. Burs. Ref.

TIFFIN, OHIO

# The RATTAN Man Says:

(Trade Mark Reg.)



"Many modern industrial fixture lighting circuits require No. 12 wire. You can make these connections with



## The MARR No. 2

—the solderless connector that does the job cheaper and better than with tape, solder and torch."

A perfect joint connector  
(Cap made of Bakelite)  
—especially adapted for #12 WIRE

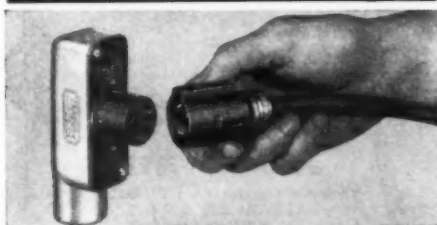
The MARR No. 2 gives you a solid, permanent connection, too. You simply insert the wires, tighten with a screw driver, turn on the Bakelite cap—and you're all set!



Approved by Underwriters

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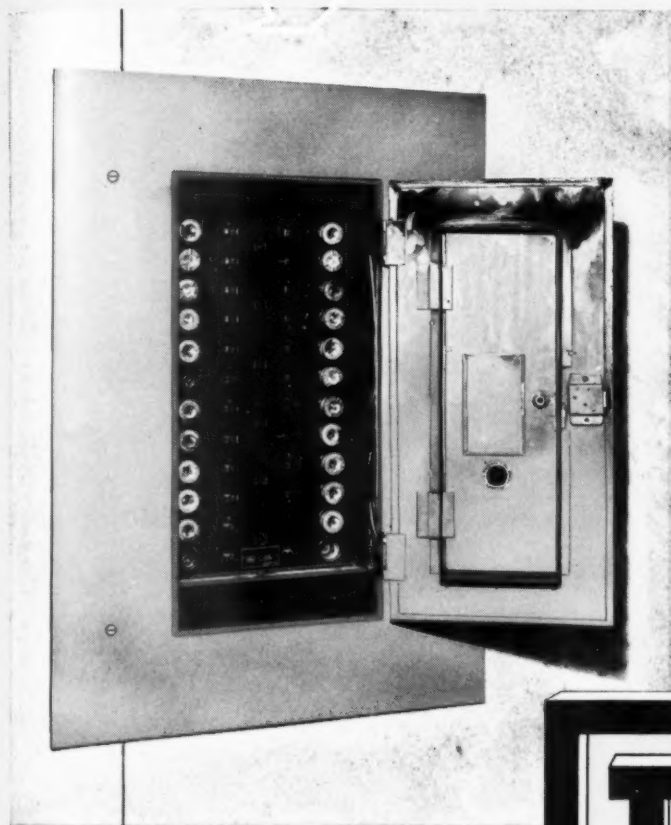
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★ These companies have supplied additional buying information on their products in the 1941 edition of the Electrical Buyers' Reference.



*Here was the Problem*

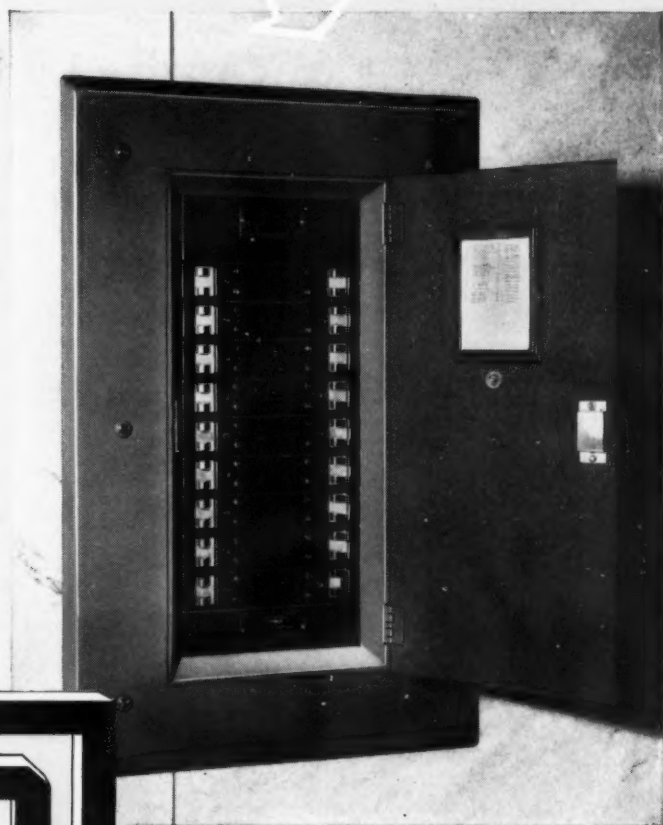


**HOW TO PROVIDE MORE  
CIRCUITS AND GREATER  
CAPACITY IN AN OVER-  
LOADED WIRING SYSTEM**

A Mid-western Public Utility Company was confronted with this problem of inadequate circuit capacity in its own office building. The old 24-circuit panelboards were running hot. Voltage drop was excessive with consequent reduction in light output. 300-watt lamps were insufficient but nothing larger could be used on the overloaded circuits. The fused lighting panel shown at left above was one of several replaced.

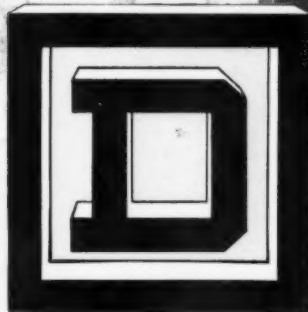
Multi-breaker lighting and distribution panels, when installed in existing panel boxes, increase the number of circuits as much as 50% and provide circuit breaker protection. Thus, they solve a problem which exists in scores of commercial and industrial buildings.

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SAME BOX, PROVIDES 50%  
MORE CIRCUITS . . . . .**

Square D Multi-breaker panelboards and the new thin wall wire were installed in the existing panel boxes and conduit. A 50% increase in the number of circuits was obtained because 36-circuit Multi-breaker panels could be fitted into the old boxes which formerly contained the 24-circuit fusible panels. A rearrangement of the wiring system permitted the satisfactory use of 500 and 750-watt lamps in the old fixtures.



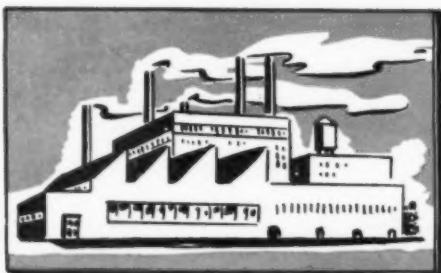
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provides completely adequate wiring  
for residences. Write for a bulletin.

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## G-E HIGH QUALITY WIRING MATERIALS

You'll find exactly the wiring materials you want in the G-E line for wiring any sort of building. The line is complete. G-E wiring materials are made to be used together and are designed for easy installation.

G-E conduit is easy to bend, threads are accurate, interior finishes are smooth. G-E BX and BraidX can be stripped quickly. G-E building wire is clean stripping and easy pulling. G-E wiring devices have large binding screws, wide mounting ears, etc.

G-E wiring materials are made from the finest raw materials obtainable. Your customers will be pleased with long, trouble-free service they give.

For further information see the nearest G-E Merchandise Distributor or write to Section CDW-187, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

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